Appendix C
HDD Construction Plan / HDD Contingency Plan

for
DRAFT
ENVIRONMENTAL ASSESSMENT

Dakota Access Pipeline Project
Crossings of Federal Projects and Flowage Easements

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Directional DRILL PROCEDURE AND FLUID CONTROL PLAN

Dakota Access Pipeline (DAPL) Project – Directional Drill Plan For United States Army Corps of Engineers (USACE) Levee Crossings

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Table of Contents

Drilling Procedure

This document is in reference to the Dakota Access Pipeline (DAPL) Project located in Iowa and Illinois. The Project consists of approximately 1,100 miles of 30" steel pipe installation, of which approximately 476 miles will be installed by Precision Pipeline as the prime contractor in Illinois and Iowa. This includes twenty-five Horizontal Directional Drills (HDD's), two of which will be constructed beneath levees under the jurisdiction of the United States Army Corps of Engineers (USACE).

Precision Pipeline (Precision) and/or its Subcontractor(s) will supply multiple directional drill rigs for this project.

It has not been determined at this time which rigs or company will complete each crossing; however, this directional drill plan will outline the general procedures that will be utilized for all of the crossings performed by Precision and/or its subcontractors that will involve USACE jurisdictional levees. Below are a list and brief description of the Horizontal Directional Drills (HDD's) that will involve USACE jurisdictional levees.

1) ILLINOIS River HDD – (This HDD will consist of the installation of approximately 6,500 feet of 30-inch-diameter steel crude oil pipeline beneath the Illinois River and adjacent Levee under the jurisdiction of the USACE within Pike and Morgan County Illinois).
2) ILLINOIS River East Levee HDD – (This HDD will consist of the installation of approximately 4,341feet of 30-inch-diameter steel crude oil pipeline beneath a canal and adjacent levees under the jurisdiction of the USACE within Scott County, Illinois).

1. HDD Equipment

Precision and/or its Subcontractor(s) will mobilize four to six maxi-rig directional drills to the project. A maxi-rig directional drill will be of the similar size or likeness as an American Augers DD-440T, a DD-660RS, or a DD-1100RS (to be used on the USACE crossings). The specifications for the maxi-rig directional drills are attached in Appendix A.

Each rig will have a spread of equipment including a field power unit, a mud system (drilling fluid reclaimer unit whose specifications is also attached in Appendix A), and a trailer to mount the drill unit. Additionally, each drill spread will have as many as ten (10) additional loads of support equipment on site. Included in these loads are items such as drill pipe, reamers, pull back heads, swivels, drill heads and collars, pipe cradles, pipe rollers, ropes, cables, and clamps.

Drill pipe will be 5-1/2" FH 21.90#/ft S-135 Premium drill pipe with current certification of compliance and inspection summary report. Precision and/or its Subcontractor(s) will provide current certification of all drill pipe to be used on the Project upon mobilizing onto the site. The drill pipe will not have been used on a prior project once it has been certified. An example of the certification can be found attached in Appendix H.

In general, all downhole tooling will be sourced from Century Products; however, based on whether the crossing is being performed by Precision or a Subcontractor will determine the exact source. In any case, all downhole tooling will be available for inspection prior to use on the project and will be in sound operating condition capable of functioning as needed for the crossings on this Project.

2. Pre-Construction / Survey

Prior to drilling operations, a pre-survey of each drill path will be made. Precision or its Subcontractor will conduct an independent one-call for the HDD crossing. Data will be collected by Precision or Subcontractor survey, such as topographic surface elevations, foreign lines, and obstructions. The data will then be forwarded for recreation in AutoCAD (or a similar drafting program), which will be used in plotting the data gathered during pilot hole operations and generating an as-built drawing when the pilot hole is complete.

Prior to the start of drilling a site specific safety plan will be provided. This will be submitted by Precision and/or its Subcontractor depending on who will be completing the specific HDD crossing. The site specific safety plan will need to be approved by the owner company prior to any drilling operations.

Resumes for the key Precision personnel for the Project are attached in Appendix B. All Precision subcontractors will be required to provide resumes of their key personnel prior to mobilization onto the project.

3. Equipment Set-up

Once the survey is complete, the equipment will be moved onto the site and placed accordingly. It will be the owner's responsibility to provide a work space that is adequate in size and shape to accommodate construction traffic. Precision or its Subcontractor will work very closely with the mainline construction Spread to meet these requirements. However, the determination of final equipment configuration will be complete once on-site. A standard site layout plan which includes ingress/egress, water supply notes, and planned equipment staging areas is attached in Appendix C.

All environmental and erosion control measures and structures are the initial responsibility of the mainline construction Spread. Precision and/or its Subcontractor will maintain these measures and structures after mobilizing to the site and they will continue to be monitored and addressed for the duration of the drill. All environmental construction methods will meet all company, permitting, and regulatory requirements.

NOTE: The water supply source for the Illinois River HDD and the Illinois River East Levee HDD will be the Illinois River.

4. Conductor Casing

Conductor casing may be utilized at the entry point to assist in stabilization of the bore hole and assure sufficient fluid and cutting returns. This may allow for a decrease in surface and surrounding soils saturation and penetration of drilling fluid while steering towards the bottom tangent. Should conductor casing be installed, it shall remain in place until the pilot hole is accepted by Company and will be removed prior to hole opening. Should the entry soils be

unstable, a large diameter conductor casing may be utilized. The conductor casing will be removed prior to product pull back.

5. Pilot Hole / Bottom Hole Assembly (BHA)

Based on the geotechnical reports, the soils will consist of primarily sand, silt, and clay with some gravel. Preliminarily we have chosen to assemble the bottom hole assembly (BHA) as follows: The BHA will consist of a 26' long 8" O.D. stainless steel non-magnetic drill collar, followed by a 6' long 8" O.D. non-magnetic orientation sub. Attached to the front of the non-magnetic collar assembly will be a jetting assembly with a 9.875" tri cone rock bit. Should, the jetting assembly hit refusal, Precision will extract the tooling out of the hole and replace the jetting assembly with a 13' long 8" O.D. mud motor with a 9.875" rotary tri cone rock bit. The bit will screw directly into the power drive of the motor without the use of any cross over subs. Precision will have a spare mud motor and rock bit as a contingency. A larger drill bit may be used at the discretion of Precision Pipeline and/or its subcontractors if conditions warrant.

During pilot hole drilling operations, survey data will be taken as each drill joint is advanced along the drill path (approximately 31 ft. per joint). The location of the pilot bit will be calculated and plotted for both horizontal and lateral alignment. This data will be compared to the design alignment/profile and adjustments shall be made as necessary to keep the profile within owner specified tolerances. The survey data and calculated values will be recorded on the "Survey Tabulation" spreadsheet. A sample copy of the tabulation sheet is attached in Appendix E.

In addition, downhole annular drilling fluid pressures will be monitored during pilot hole operations through the use of a pressure tool as part of the BHA. The sensor port on the pressure tool will be approximately 5 feet behind the drill bit; if a mud motor is necessary to penetrate dense sand, the sensor port on the pressure tool will be approximately 20 feet behind the drill bit. The annular drilling fluid pressures will be maintained below the permit requirements. In addition, the drill crew will be continuously monitoring the drilling fluid returns to the entry and/or exit pits. If drilling fluid returns begin to slow or cease or annular pressure rise above acceptable limits, mitigation measures will be employed to restore returns and reduce annular drilling fluid pressures (See Contingency Measures Below).

Immediately upon completion of the pilot hole, Precision shall submit to the Company a plan and profile of the HDD in sufficient detail and of appropriate accuracy to permit Company to confirm acceptability of the boring. Company shall approve the profile prior to reaming and pullback operations. In addition, all data collected during the pilot phase of the crossing will then be sent to our AutoCAD department to plot an as built that will be provided after the crossing is successfully pulled back.

The steering system that will be utilized for the Project will be a Tru-Track or Para-Track steering type system. Should the need arise for a Gyroscopic Steering System to transverse areas unable to be electronically tracked by coil wire, SlimDrill International (or similar) will be utilized.

6. Reaming

After the pilot hole has been completed the resulting hole will be enlarged in various steps or stages as follows:

1. 24” ream pass
2. 36” ream pass
3. 42” ream pass

Precision and its Subcontractors use specialized reamers and tooling specifically designed for the subsurface conditions encountered during the pilot hole. Upon completion of the pilot the drilling contractor may push ream or pull ream depending upon entry/exit elevations, or soils and formations drilled through. The tooling to be used during the reaming process as well as the actual number of ream passes, will be determined upon successful completion of the pilot hole, and will be based on “but not limited to” the following criteria:

A. Type of Formations encountered.
B. Penetration rates during pilot.
C. Stability of the formation.
D. Length of crossing.

During reaming operations, downhole annular pressures will be monitored through the use of a pressure tool as part of the reaming assembly. The sensor port on the pressure tool will be approximately 5 to 10 feet behind the reaming tool. The annular drilling fluid pressure will be maintained below the permit requirements. In addition, the drill crew will be continuously monitoring the drilling fluid returns to the entry and/or exit pits. If drilling fluid returns begin to slow or cease or annular pressures rise above acceptable limits, mitigation measures will be employed to restore returns and reduce annular drilling fluid pressure (see Contingency Measures below). The annular solids content within the drilling fluid will be maintained below 20 percent by adjusting the penetration and/or pump output rates to help prevent the drilling fluid from becoming overloaded with cuttings.

7. Mud & Drill Process Monitoring

The directional drilling process involves a non-hazardous drilling fluid made up of primarily water and bentonite (de-hydrated clay). Bentonite is a naturally occurring, non-toxic, inert substance that meets NSF/ANSI-60 Drinking Water Additive Standards and is frequently used for drilling potable water wells. Products used for drilling operations will be used from the client’s approved list. If any additional products not on the list are proposed, Precision or its subcontractor will submit for approval prior to use.

The drilling fluid will be mixed in a mud mixing tank relative to the mud system size to a maximum volume of 7,500 gallons and in accordance with manufacturer’s recommendations. A mud composition of approximately 15 to 20 pounds of powder bentonite will be mixed with 100 gallons of water. The most effective mud composition for a given soil condition will be established, monitored and maintained throughout the drilling process. The drilling fluid will be sampled and tested daily during drilling operations. A third party mud engineer (resume to be provided) will make recommendations regarding maintenance of the mud composition.

The following table can be used as a general guideline for targeted fluid viscosities given a specific soil condition. However, actual field results typically dictate a drilling fluid target viscosity.

Targeted Drilling Fluid Viscosities

Sand	60 – 80 Viscosity
Silt	50 – 70 Viscosity
Clay	40 – 50 Viscosity
Rock	60 – 80 Viscosity

Once the drilling fluid is thoroughly mixed to an acceptable consistency, it is pumped from the mud tank to the drill rig. It is then pumped under pressure through the drill stem at a rate between 50 to 1000 gallons per minute (gpm) to the drill head or reamer. The drill fluid, along with borehole cuttings, returns along the annular space created between the drill stem and the formation wall. Drilling fluid returns to either the entry pit or exit pit, depending on the drilling activity and tool location. The mixture of materials is then pumped by a submersible pump to the mud cleaning system.

The first phase of the mud cleaning system occurs at the shakers. Heavy solids are sifted out by a shaker with screens sized for the specific soil condition. The solids are then deposited into roll-off containers where they will be stored until disposal.

The second phase of the mud cleaning system removes the medium and fine sands. The desilter/mud cleaning unit removes the remaining cuttings from the drilling fluid. These cuttings are again stored in roll-off containers while the recycled drilling fluid is pumped back downhole and re-used in the drilling process.

Numerous activities are monitored throughout the entire drilling operation. These include, but are not limited to, viscosity testing of drill mud, gel strength, pH levels, sand content percentage by volume, fluid loss through fluid return, cake thickness, monitoring of drill times, pull and push pressures, rotary torque, R.P.M., differential, type of formation, mud pressures, drilling fluid being pumped downhole. Tracking of this information provides Precision or its Subcontractors with the ability to refer back to these records to determine what worked best while drilling through the various formations. This allows decisions to be made that make the reaming operation more efficient on subsequent ream passes. During completion of the pilot hole Precision monitors pump volumes and downhole annular pressures to assure that all precautions are taken to minimize the risk of inadvertent returns. Precision anticipates running downhole annular pressures of less than about 125psi through the pressure monitoring zone and 300 to 450 gpm for the soil types anticipated to be encountered on the Project. The properties of the drilling fluids anticipated to be used during the completion of the Project will be as recommended by the drilling fluids engineer, and are shown in Appendix D. These properties will be modified during the actual drilling operations as needed, and at the sole discretion of the drilling superintendent and third party mud engineer. The MSDS for the drilling fluid products that will be used are included with the drilling fluids proposal and can be found in Appendix D. Should the need arise to use other down hole fluid products such as Sand Master, Torque Breaker or Clay Breaker products, the MSDS will be provided. Only products that are approved by the owner company will be used on the Project, if additional products are requested by Precision or its subcontractors they will be submitted for approval by the owner company prior to being used.

Precision will test the drilling fluids a minimum of 6 times during a 12 hour shift and will submit a mud log at the end of every shift along with the daily drill log. Precision will have a third party drilling fluids engineer (mud engineer) on site for the duration of the Project to perform the tests on the drilling fluids throughout the day. The resume for the drilling fluids engineer will be provided to the owner company prior to drilling.

8. Swab Pass

After the reaming operation is complete, one or more swab passes will be made from the exit side to the entry side; a downhole annular pressure tool will not be utilized within the swab assembly. Precision and its Subcontractors will use a 42" reamer or ball assembly. The purpose of this pass is to evacuate cuttings from the bore hole and to ensure adequate clean drilling fluid volume is maintained within the bore hole and to ensure the bore path is free of cuttings for an easier pull back The number of swab passes will be determined by both the drilling contractor and the on-site Company representative, based on pull forces and rotary torques observed during the first swab pass and the observations of the drilling fluid returns.

9. Pull Back

Once the pullback commences, it will continue on a 24 hour per day schedule until the pipe is pulled into place or the pull back is stopped. The work areas will be properly illuminated on the entry and exit sides through the utilization of portable light plants.

Precision or its Subcontractor will provide adequate support rollers for the pipeline during the pullback of the pipe string into the pre-drilled hole. The rollers and cradles will be of a type that will prevent damage to the pipe and will be of sufficient number, as recommended by the pipe manufacturer, to prevent over stressing due to sag bends during the pullback procedure. The pipe shall be supported at all times, including pullback, to maintain a free stress arc which limits pipe bending and internal hoop stresses to within manufacturer's limits.

The pullback assembly for this HDD will consist of a rock reamer or ball attached to a 245 ton swivel. All threaded connections for this assembly will have proper Make Up Torque (MUT) applied. To ensure the proper MUT, Precision will torque the connections between the reamer and pull head by adding the assembly at the drill rig. Utilizing the rig's rotary torque gauges, Precision will torque the assembly to proper MUT. Second Precision will use the industry practice of applying the buck-up/breakout wrenches and re-torque to proper MUT. The assembly will then be transported to the pipe side. On pipe side, the assembly will be added to the pull section prior to pull back. At that time using the rig from entry side, the buck-up/breakout wrenches will again be used to torque through the entire string. Welded straps may be added on the outside of the tool joints to help reduce the risk of unthreading. If straps are welded, proper welding procedures (pre-heat, cooling, etc.) will be utilized to maintain the integrity of the drill steel.

During pull back operations, drilling fluid will be recycled as operations allow. In the event that drilling mud cannot be recycled or forwarded to another active HDD, the drilling mud will be disposed of according to the Company specifications through land farming or disposal site.

Water will be added to the product pipe as it is pulled into the hole for buoyancy control. The use of buoyancy control will help reduce the installation forces during the pullback. This water

will need to be stored on site in frac tanks. This ballast water will be pumped into the product pipe at a rate determined on site. It will be pumped through 4" or similar HDPE that will be pre-loaded in the product pipe. The amount of water added will be tracked by the use of a flow meter and/or tank volumes. The buoyancy control plan is attached in Appendix F.

Should the Army Corps of Engineers require grouting of the annular space; tremmie pipe will be installed into the bore hole along the product pipe to the specified depth. An approved bentonite grout mixture will be pumped through the tremmie pipe while the tremmie pipe is being extracted at a predetermined rate to match the cubic volume requirement to fill the annular space between the reamed hole and product pipe. This process will be closely monitored to control the risk of hydro fracturing.

10. Clean-up / De-mobilization

Upon completion of a successful pullback of the product line and completion of post-installation grouting requirements, Precision or its Subcontractor will demobilize all equipment to a pre-determined staging area or to another drill site and clean up and restoration of the current site will take place.

11. Contingency/Prevention Measures

A. Equipment Malfunction

Precision carries spare motors, pumps, parts, hoses and all the major components of the rig on-site in a 53 foot van trailer. A list of major spare parts will be maintained on-site.

B. Pilot Hole Deviations

The pilot hole will be drilled to agreed upon tolerances and specifications related to alignment, elevation, curvature, and exit location. Survey data will be available at all times and distributed on a daily basis.

C. High Annular Pressures or loss of Returns

In the event that high annular drilling fluid pressures or loss of drilling fluid returns are observed during pilot hole or reaming operations, one or more mitigation measures will be utilized to reduce the annular pressures. These measures may include.

a) Swabbing the hole to clear obstructions and entrain drilled/reamed cuttings into the drilling fluid returns.
b) Circulating drilling fluid downhole to help remove cuttings that have settled out of the drilling fluid and replace the solids laden drilling fluid downhole with fresh drilling fluid.
c) The use of weeper or jet subs in the downhole drill pipe string to help entrain cuttings into the drilling fluid.
d) The use of either small-diameter or large-diameter conductor casing to help stabilize the shallow portions of the hole and maintain drilling fluid returns.
e) Disposing of heavy weight drilling fluid and replacing with fresh drilling fluid.
f) Amending the drilling fluid properties to aid in removing cuttings from downhole.
g) Completing a pilot hole intersect if necessary.
h) Reaming the hole from both directions.

D. High Torque While Reaming

If torque builds up during the reaming phase, the reamer will be retracted from the hole until torque levels lower to acceptable levels. Often, the reamer does not need to be completely retracted from the hole. If, after completely retracting the reamer, torque values are still high, a small diameter swab or jetting sub (weeper sub) will be tripped through the hole to ensure adequate fluid circulation.

E. Pipe Stuck During Pullback

Precision will have a 24” Hammer with all the attachments for forward ramming or pipeline retraction. Hammer specs are attached in Appendix G. Should the product become stuck or lodged down hole during the pullback, Precision will analyze the situation and determine whether to proceed and receive help from the hammer to finish installation or to pull the product pipe from the bore hole and then rework the hole. Should a pneumatic hammer be required, the contractor will install a sacrificial joint of pipe between the hammer and the main product pipe. A pneumatic hammer will not be employed without prior approval from the Client.

Fluid Control Plan

The horizontal directional drill (HDD) technique is an established trenchless technology that is commonly used to install pipelines and other buried utilities with minimum environmental, property and construction related impacts. The purpose of this Fluid Controls Plan is to establish preventative procedures to address potential impacts associated with the inadvertent return of drilling fluid during the HDD process and hydraulic spills from equipment. MSDS sheets are available upon request for reference. Site specific objectives towards a holistic plan are:

A. Minimize potential for inadvertent returns associated with the drilling operation.
B. Provide for the detection of inadvertent returns.
C. Protect environmentally sensitive areas.
D. Pre-plan an organized response to minimize potential impact.
E. Ensure appropriate notifications are made in the event of an inadvertent return.

1. Site Specific Conditions

The Project consists of twenty five HDD crossings, two of which will cross levees that are associated with a Federal project under the jurisdiction of the USACE. Precision and its Subcontractor will follow the Fluid Control Plan as a general plan for all of the crossings performed. Each crossing is unique in the actual needs to comply with the contingency plan and the Project specifications.

2. Response Equipment and Secondary Containment

Precision and its subcontractors understand the environmental sensitivity of this Project and will maintain a readily available, and sufficiently maintained supply of hay bales, silt fence, shovels, brooms, small and large capacity pumps, discharge hose, and sand bags. Vacuum trucks will be onsite throughout the day, to respond immediately to any potential environmental concerns. Heavy equipment, such as backhoes, can be utilized for control and clean up. Furthermore, Precision will temporarily stop all drilling activity in the event of surface seepage.

The following additional materials and equipment may be maintained at a nearby location in sufficient quantities to ensure containment of any inadvertent returns of drilling fluid:

A. Light tower(s) will be available if necessary so that cleanup work can continue after dark.
B. A boat with appropriate personal safety equipment will be available in the case of major water body crossings.
   Flexible plastic piping will be available for potential mitigation where small creeks or drainages are involved Additionally Precision will have on site an adequate supply of large and small spill kits for oil and fuel should any be inadvertently released from equipment. All large stationary equipment that is equipped with an engine will be placed in secondary containment. This will include the use of thick Mil plastic (visqueen) placed on the ground with a containment wall built on the perimeter of the equipment utilizing hay bales or a suitable substitute.

3. Designated Contacts

List of Subcontractors

TBD

Designated Emergency Contacts

TBD

4. Agency Notification

The drill crew will be responsible for immediately notifying Precision's Project Manager if seepage should occur. Precision's Project Manager will be responsible for providing notification to the Client, who in turn, will notify the appropriate agencies. The Project Manager and Client will immediately assess the situation. During the assessment of the seepage, Client and the Project Manager will estimate the quantity of drilling fluid that has seeped and the square footage of the area that has been impacted, in the event of a seepage that may impact land use, public property, water quality, or aquatic organisms, etc.

5. Inadvertent Returns

The HDD method has the potential for loss or seepage of drilling mud into the geologic formation through which the drill passes. In some cases, the drilling fluid may be forced to the surface resulting in an inadvertent return. In some cases, an inadvertent return of drilling fluid can be caused by existing conditions in the geologic materials (e.g., fractures or very soft sands) even if the down-hole pressures are low.

6. Mitigation

Prior to construction, the following procedures shall be followed:

A. Maintain necessary response equipment on-site and ensure it is in working order.
B. Upon Precision's selection of the preferred drilling fluid base material and prior to construction, Precision will provide the manufacturer's material safety data sheet (MSDS) for review by Client. If the material is deemed unacceptable in its ability to pose little or no threat to the surrounding environment if seepage should occur, Client will notify Precision and a new material will be selected. All subsequent drilling fluid materials are subject to identical review and approval by Client.
   The drilling fluid selected for use by Precision will be formulated in a manner that does not present an imminent threat to water quality or the aquatic environment. Selection of appropriate materials that will compose the drilling fluid will be done in a manner that protects ecological resources.
C. Install a filter fabric fence between the boring pit and the adjacent stream or wetland

7. In-stream Return

If seepage occurs in a river, there may be a visible plume. Minor seepage may be difficult to detect due to the natural turbidity of the river water and the high specific gravity of bentonite clay based drilling fluid, which causes it to remain low in the water column. Once seepage is detected and drilling fluid pumps are stopped, there will be minimal disturbance to river sediment. There will be very little pressure to disturb surface sediment because of the distance that the drilling fluid must travel to reach the river bottom. The composition of the drilling fluid is primarily water and bentonite clay. If a small amount is released into a river, the rivers' current usually quickly dissipates it. In order to have early detection of possible seepages within the Project, the contractor will closely monitor the drill operation as the bore progresses.

If the inadvertent return occurs below the water, Precision or its Subcontractor may momentarily stop the activity. The pressure of the water above the pipe will mitigate seepage of excess mud. If the drilling mud congeals, bentonite will usually harden and seal any subsurface pathways. Precision or its Subcontractor may install sand bags for contaminant if the drilling mud does not congeal. Appropriate parties will be notified.

8. Detection, Monitoring, and Field Activities

Detection of a drilling fluid seepage includes identifying those conditions that may indicate a loss of pressure containment within the drill hole. It will also be based on visible signs that surface seepage has occurred.

Horizontal directional drilling is a technically advanced process. The detection of drilling fluid seepage prior to it occurring is highly dependent upon the skills and experience of the drilling crew. Each drilling situation is unique in that the behavior of the subsurface material is highly variable and can be difficult to predict. There is no in-hole monitoring equipment that can detect drilling fluid seepage; therefore, a combination of factors such as those listed below must be properly interpreted to assess conditions that may have the potential of causing drilling fluid seepage.

A seep occurs when there is a failure to maintain pressure in the hole. The most obvious signs of a drilling fluid seepage are surface seepage or loss of circulation of the drilling fluid. One of the functions of the drilling fluid is to seal the hole to maintain the down hole pressure. The loss of returning drilling fluid is a sign that pressure is not being maintained in the drill hole and seepage is possibly occurring. If there is a reduction in the quantity of drilling fluid returning to the drill site (loss of circulation), this could be a warning sign. However, some loss of drilling fluid is also normal in the drilling process. During the drilling process, a loose sand or gravel layer may be encountered which would require additional drilling fluids to fill in the voids in the substrate. Consequently, drilling fluid loss itself is not an indication of a potential seepage condition. It is the loss of drilling fluid in combination with other factors that may indicate a potential seepage condition. For example, if there is a loss of drilling fluid and the return cuttings do not show a large quantity of gravel, then this could indicate a loss of containment pressure within the borehole.
Once surface seepage of drilling fluid is detected, the drilling crew will take immediate corrective action. The primary factor causing the surface seepage to occur is pressure from the drilling fluid pumps. Therefore, the most direct corrective action is to stop the rig pumps. By stopping the pumps, the pressure in the hole will quickly bleed off. With no pressure in the hole, the

surface seepage will stop. Stopping the pumps will be done as soon as surface seepage is detected or if such seepage is suspected.

There is a greater potential for drilling fluid seepage at the entry and exit locations of the crossing, due to shallow profile depth and loose near-surface soils. In the contingency planning for the pipeline crossing, drilling fluid seepage at the entry and exit locations has been considered, and preventative actions have been developed. The entry and exit locations have dry land segments where drilling fluid seepage can be easily detected and contained. To isolate and contain potential drilling fluid seepage at the drill site, a berm can be constructed around the drilling site to isolate it from the Project. Straw bales or silt fence can also be part of the berm on the waterside of the drilling area. To contain and control drilling fluid seepage on land, there will be earth moving equipment, portable pumps, sandbags, and straw bales available on site. Any drilling fluid seepage will first be contained and isolated using dirt berms; straw bales, or silt fencing. The area will then be immediately cleaned up using vacuum trucks, and the drilling fluid will be hauled to the closest drilling site. In the event of seepage on land, it may only be necessary to reduce the down hole pressure to ensure containment of the fluid. Upon containment and establishment of controls to contain further seepage, down hole pressure may be increased to original levels at the discretion of Precision and the drill crew. The location of the seepage will be monitored for any significant condition changes.

After the drilling fluid seepage has been contained, Precision will make every effort to determine why the seepage occurred. Once Precision and the drill crew have determined the cause of the seepage, measures will be developed to control the factors causing the seepage and to minimize the chance of recurrence. Developing the corrective measure will be a joint effort of the drilling crew and will be site and problem specific.

In some cases, the corrective measure may involve a determination that the existing borehole encountered a void that could be bypassed with a slight change in the profile. In other cases, it may be determined that the existing hole encountered a zone of unsatisfactory soil material and the hole would then have to be abandoned. If the hole is abandoned, it can be filled with drilling slurry (bentonite).

9. Hydraulic/Fuel Spills

The following actions will be performed to reduce the potential for the severity of spills from the stationary equipment on site.

A. All stationary equipment will be placed in a secondary containment.
B. Assure routine maintenance of the diesel equipment and associated equipment is performed in accordance with the manufacturer's recommendations.
C. Not performing maintenance work on the diesel equipment or in the immediate area of the diesel equipment during fuel deliveries.
D. Perform visual inspections (weekly for temporary units; monthly for backup units) of the diesel equipment and associated equipment and document the findings and corrective actions (if needed).
E. Perform visual inspections of all diesel equipment and associated equipment daily.
F. A spill response kit shall be available on the fuel delivery truck and/or in the immediate vicinity of any diesel equipment.

The following actions shall occur when a fuel delivery is made:

A. Determine the fuel level in the tank and calculate the volume required to be delivered prior to dispensing fuel.
B. Prior to initiating fuel transfer, the fuel vendor will confirm that sufficient space is available in the receiving storage tank to receive the contents of the tank truck.
C. The tank truck unloading will be done during daylight hours except under emergency conditions, and will be scheduled in advance whenever possible.
D. The tank truck must be operated by a trained fuel transfer operator, who will ensure that locked valves and fill caps are unlocked and that spill response materials (absorbent pads, booms and absorbent material) are in adequate supply.
E. Tank trailer brakes shall be set and the driver shall remain with the wet end of the delivery hose at all times. Ensure proper methods are used for hose connection, tank filling, and hose disconnection and precautions are taken to avoid unnecessary dripping and/or releases from hoses and connection equipment. Ensure that the storage tank is vented prior to connecting unloading line.
F. The tank truck operator will be supplied one person to assist in the event of a spill.
G. Prior to filling (and again prior to departure of tank truck), the lowermost drain and all outlets of the vehicle must be examined for leakage and if necessary tightened, adjusted or replaced to prevent leakage while off-loading (or while in transit).
H. Once unloading has ceased, the hose shall be handled in a way as to keep the hose from dripping. Any small dripping material shall be contained for removal.
I. If any spill occurs during the filling process, fuel flow must be stopped immediately and spoil-reporting procedures initiated immediately.

10. Spill Response

In most cases, releases occur during fuel delivery when the driver has access to a spill response kit. However, in case the driver does not have the appropriate response equipment, the site will have a spill kit located adjacent to the diesel equipment. In addition, if a spill occurs from the equipment, the site should be capable of controlling a small to moderate spill and cleaning up a small spill with the on-site spill kit. This spill kit will be checked twice yearly to ensure that the kit has not been depleted of its materials. In the event of a spill, the table on the following page lists actions to be performed and the person or persons responsible for performing them.

Appendices

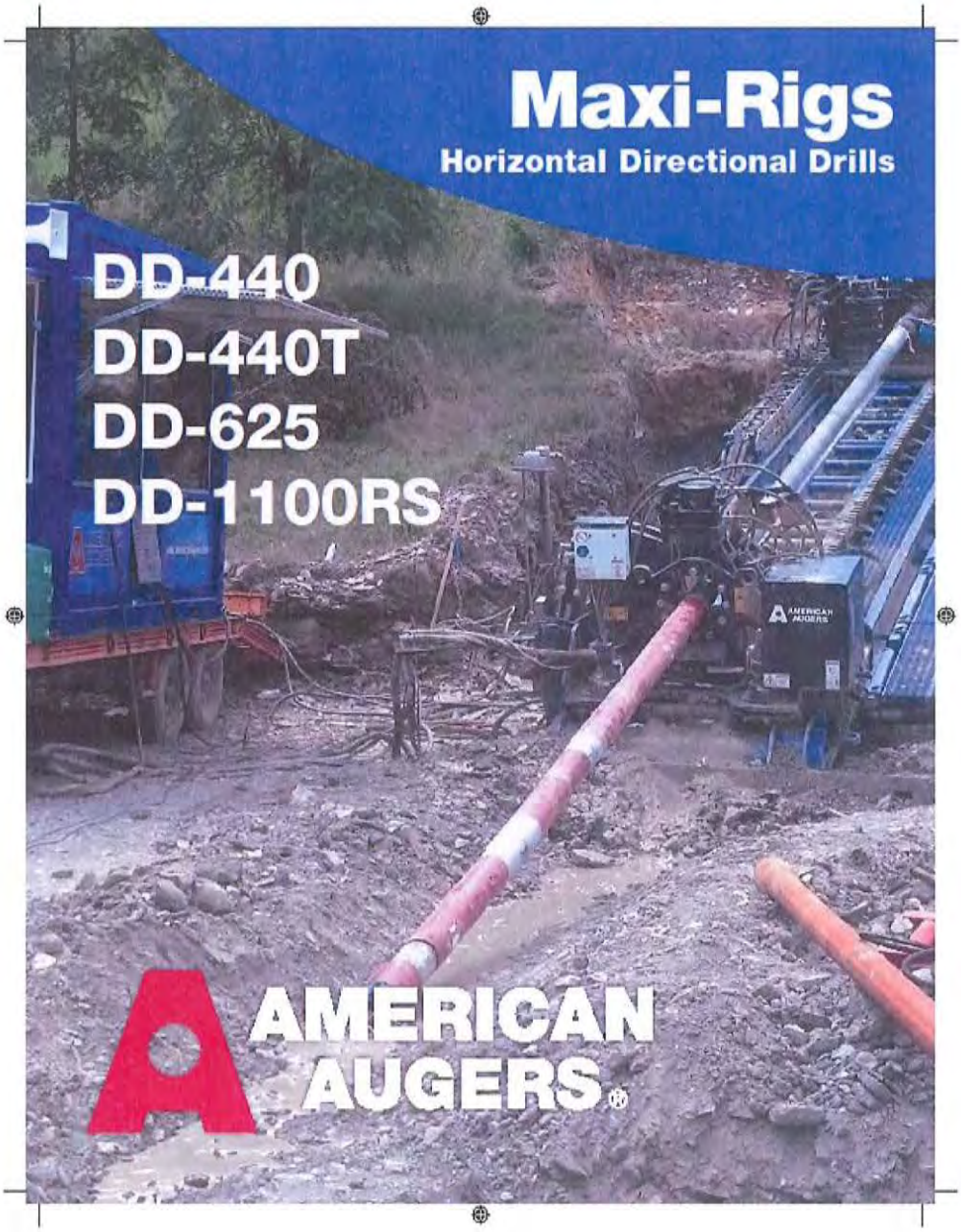
A. Equipment Specifications
B. Key Personnel Resumes
C. Typical Site Layout
D. Drilling Fluids Program
E. Sample Forms
F. Buoyancy Control Plan
G. Pipe Hammer Specifications
H. Drill Pipe Inspection / Certification Reports

APPENDIX A
EQUIPMENT SPECIFICATIONS

APPENDIX A

American Auger DD 440T Specifications

Below are the standard equipment specifications for the American Augers horizontal directional drill rigs. Similar equipment specifications can be provided if horizontal directional drill rigs from other manufactures are used.


Maxi-Rigs
Horizontal Directional Drills
DD-440
DD-440T
DD-625
DD-1100RS
AMERICAN AUGERS

DD-440 PERFORMANCE SPECIFICATIONS

POWER TRAIN	
Engine	(2) Caterpillar® C-11 Tier III Diesel
Rating	375 HP (279.6 kW) each 750 HP (559.3 kW) total
Fuel Capacity	270 U.S. Gallons (1,022 L)
Hydraulic Capacity	230 U.S. Gallons (871 L)
Hydraulic Filter	High Pressure Filtration Return to 6 Micron ABS
Battery	(4) Deka 908DMF 12 V, 1450 CCA
Noise Rating	104 dB(A) 1 Meter 95 dB(A) 3 Meter
Run-On-One-Technology-System (ROOTS)	• Simultaneously run both power units • Permits one power unit to run while powering through the unused power unit • Allows one power unit to run but keeps the unused power unit isolated • Excercise the ability to have one power unit running but have the unused power unit removed • Unit maintains full power with single engine, but system runs with half rotational RPM and half carriage drive speed

CARRIAGE SYSTEM	
Maximum Thrust/Pullback	440,000 lbs. (200 Tonnes)
Carriage System	Rack & Pinion, (2) Pinion Drive with Adjustable Force Limiter
Maximum Carriage Speed	110 ft. (33.5 m)/minute
Carriage Motors	(2) Hydraulic 160cc, Radial Piston/Dual Displacement
Carriage Brakes	(2) Spring Applied/Hydraulic Release
Carriage Gearbox	(2) Planetary Drives

ROTARY DRIVE	
Rotary System	(3) Pinion & Gear Drive with Infinitely Variable Torque
Maximum Rotary Torque	60,000 ft-lbs. (81,350 Nm) @ 0 – 43 RPM
Minimum Rotary Torque	25,500 ft-lbs. (34,570 Nm) @ 0 – 80 RPM
Maximum Rotary Speed	80 RPM
Rotary Motors	(3) Hydraulic, 160cc, Axial Piston, Variable Displacement
Rotary Brakes	(2) Spring Applied/Hydraulic Release
Fluid Course	4 in. (102 mm)
Mud Flow Rate	1,000 U.S. Gallons (3,785 L)/minute
Maximum Mud Pressure	1,500 psi (103 bar)
Mud Swivel	Rear Mounted, 5.5 in. (140 mm) IFLH Pin
Slip Spindle	6 5/8 in. (168.3 mm) API-FH Pin
Other Features	Digital Tachometer, Adjustable Torque Limiter, Wiggle Steer®

WRENCH	
Wrench Style	Triple Jaw with 12 in. (305 mm) Separation
Wrench Travel	Wrench has full length thrust frame travel
Maximum Breakout Torque	154,000 ft-lbs. (209,500 Nm)
Maximum Makeup Torque	101,700 ft-lbs. (137,900 Nm)
Clamp/Grip Range	2 1/4 in. – 10 1/4 in. (70 – 273 mm) OD
Wrench Assembly Motor	(2) Hydraulic LSHT, 12 CIR
Wrench Assembly Brake	(1) Spring Applied/Hydraulic Release
Wrench Gearbox	(2) Planetary Drives, SGL
Hydraulic Wrench Cylinder	(6) 8 in. Bore x 3 in. Stroke (203 - 76.2 mm)

DRILL RIG	
Drill Angle	10° - 18°
Drill Pipe	Range II – 34 ft. (10.4 m)
Drill Rig Mounting	Tri-Axle Trailer
Axle Spacing	60 in. (1,524 mm)

SAFETY
• Es!Lok – Exit Side Lockout System with 5,280 ft. (1,609 m) Range • ZAPALERT – Electrical Detection Device • Emergency Shutdown Switch at the Operators Console • (7) Attachable handrails for full length thrust frame walkway • Work Lights - (4) 500 Watt (each)

DIMENSIONS	
Length	51 ft. 5 in. (15.7 m)
Width	8 ft. 2 in. (2.5 m)
Height	13 ft. 6 in. (4.1 m)

WEIGHTS	
Total Weight	**93,800 lbs. (42,547 kg)**
Total Weight w/o Wrench	86,000 lbs. (39,009 kg) – *Wrench is Removable for Lighter*

AMERICAN AUGERS®

DD-440T

Horizontal Directional Drill

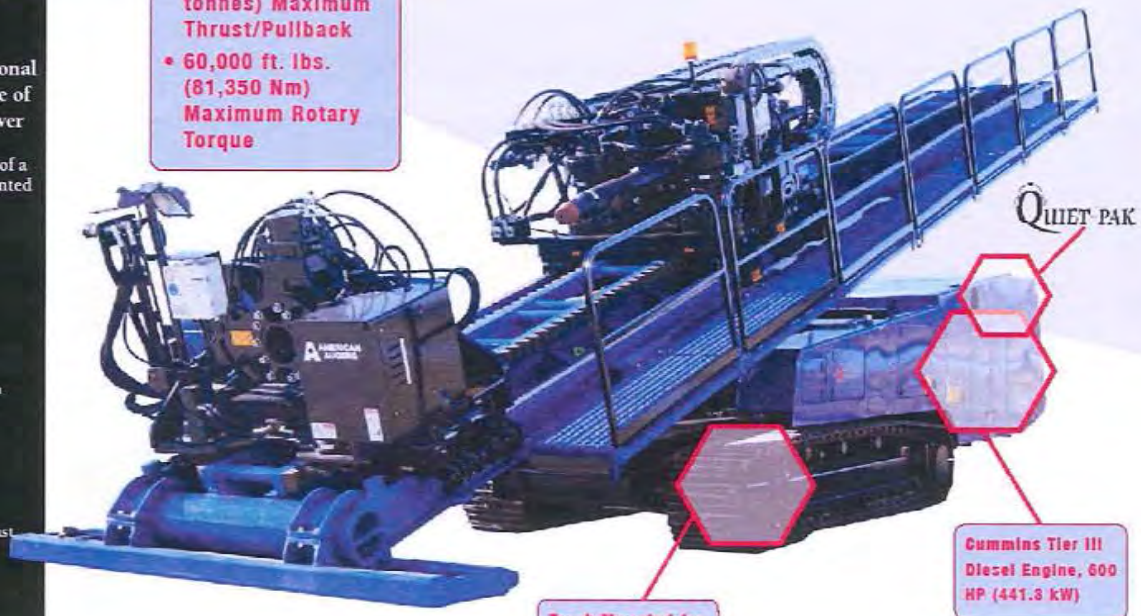
The only Track Mounted Directional Drill that offers the highest range of field-proven thrust/pullback power

The same power, torque and benefits of a DD-440 in a highly mobile track-mounted format. It's your preference!

- PINION AND GEAR Rotary Drive
- ADJUSTABLE TORQUE LIMITER for Rotary and Makeup Force
- ADJUSTABLE FORCE LIMITER for Thrust and Pullback
- INDEPENDENT CONTROLS AND HYDRAULIC CIRCUITS for Thrust/ Pullback/Torque and Auxillary Operation
- WIRELINE COMMUTATOR for Speedy Hookup of the Wireline Guidance Equipment
- VARIABLE Entry Angle
- HYDRAULICALLY OPERATED Pipe Supports
- DEDICATED Pumps for Rotary and Thrust
- WRENCH TRAVELS Full Length of the Thrust Frame
- ACCOMODATES Range II Drill Pipe
- WIGGLE STEER™
- RUN-ON-ONE-TECHNOLOGY-SYSTEM (ROOTS) capable

www.AmericanAugers.com

- 440,000 lbs. (200 tonnes) Maximum Thrust/Pullback
- 60,000 ft. lbs. (81,350 Nm) Maximum Rotary Torque



MCR-10000 MUD RECLAIMER

18

MCR-10000 PERFORMANCE SPECIFICATIONS

POWER TRAIN	
Generator Set	225kW prime rating - 60Hz Cummins diesel 8.9 L
Fuel Capacity	220 US gallons (833 L)
Noise Rating	90.3 db(A) at 7 meter range

OPERATING CONTROLS	
Remote Controls	Pendant for offload valve start/stop Pendant for trash pump start/stop
CENTRIFUGAL MUD PUMPS	
Main Pump	Centrifugal mud pump (1) 3-phase electric, 50 HP (37kW) 480 V for mixing/agitation • Inlet Size: 6 in. (152.4 mm) • Outlet Size: 5 in. (127 mm) • Impeller Size: 11 in. (279 mm)
Pump/Motor Assembly	(1) 3-phase electric, 60 HP (45 kW) 480 V for charging of hydro-cyclones • Inlet Size: 8 in. (203 mm) • Outlet Size: 6 in. (152 mm) • Impeller Size: 14 in. (355 mm)
Bentonite Mixing System	Polyethylene constructed dry bentonite mix hopper

CLEANING SYSTEM	
Linear Motion Shakers	(3) 1 in. cut with 27 sq. ft. (2.51 m2) area with (3) 50 & (6) 70 mesh screens (2) final cut with 27 sq. ft. (2.51 m2) area with (3) 175 & (3)

CLEANING SYSTEM	
	210 mesh screens *various additional mesh sizes available*
1st Cut Shaker Cleaning Capacity	Estimated 900 US gallons (3,406 L)/minute
Particle Separation System	(4) 10 in. (254 mm) **Krebs gMax® desanding/desilting hydro-cones**manifold mounted
Particle Separation System Cleaning Capacity	Estimated 1,500 US gallons (5,678 L)/ninute

**Note: Cleaning capacities will vary depending on the overall mud weight, drilling fluid mixture content and working environment*

FLUID TANKS	
Screen Tank	5,600 US gallons (21,200 L) capacity
Cleaning Fluid/Mixing Tank	3,700 US gallons (14,010 L) capacity
Other Features	18 in. (457 mm) cleanout ports

TRANSPORT	
Mounting	Rock-over design on tri-axle suspension
Axle Spacing	4 ft. 6 in. (1.22 m)

SAFETY

- Anti-slip walkways & handrails
- Stairway and ladder with anti-slip treads
- Emergency shutdown switch on operator's control panel
- Electrical grounding stake with cable
- (4) 500 watt quartz work lights

**Note: All product performance specifications, components, weights, dimensions and other related information is subject to change without notice from the manufacturer.*

DIMENSIONS	
Maximum Length	53 ft. (16.2 m)
Maximum Height	13 ft. 1 in. (4 m)
Maximum Width	98.4 in. (2.5 m)

WEIGHTS	
Total Weight	70,000 lbs. (31,751 kg)

P-600 MUD PUMP

P-600 PERFORMANCE SPECIFICATIONS

POWER TRAIN	
Engine	Caterpillar© C-15 Tier III Diesel **Tier III or Tier 4i determined by country of purchase*
Rating	475 HP (354 kW)
Maximum Speed	2100 RPM
Noise Rating	1 Meter Distance 104 dB(A) 3 Meter Distance 95 dB(A)
Fuel Capacity	300 U.S. Gallons (1,136 L)
Transmission	Eaton-FRO-16210B, 10 Speed
Clutch	15.5 in. (394 mm) Twin Disk

22

POWER TRAIN	
Battery	(2) Deka 908DMF 12V,1450 CCA

CONTROLS	
Remote Controls	Mud Pump Throttle, Mud Pump Start/Stop, Clutch Actuator, Horn remote
Remote Instruments	Digital Mud Flow Meter (gallons/liters per minute)

PUMP	
Pump Design	Tri-plex 600GPM
Rated Capacity	600 U.S.Gallons (2,067 L)/min.
Bore x Stroke	6 x 6 in. (152.4 x 152.4 mm)
Maximum Pressure	1,505psi (1043 bar)

**Note: Pump Capacity will Vary Depending on the Overall Mud Weight, Drilling Fluid Mixture Content, and the Working Elevation*

ACCESSORIES

- **Pulsation Dampener on inlet and discharge**
- **(2) 25 ft. (7.6 m) suction hoses with 6 in. (152.4 mm) Kamlok Fittings**
- **(2) 25 ft. (7.6 m) Discharge Hoses with 3 in. (76.2 mm) NPT Hammer Unions**
- **Liner Wash System w/Supply Tank**
- **24 V Work Lights**

DIMENSIONS	
Length	20 ft. (6.096 m)
Height	9 ft. (2.7 m)

DIMENSIONS	
Width	8 ft. (2.49 m)

WEIGHTS	
Total Weight	29,800 lbs. (13,520 kg) estimated

APPENDIX B
KEY PERSONNEL RESUMES

Franky Busani

10617 E. Portobello Ave
Mesa, AZ 85212

Experience

Oz Directional Drilling
38220 N 103rd Place
Scottsdale, AZ 85262
Ph: 602-617-1115
Foreman/Driller
February 2013-Present

- Drill rig Operator
- Supervise daily operations.

Project List

OWNER	LOCATION	CONTRACTOR	CROSSING	Length	Size
Access Midstream	Towanda , PA	Encompass	King Unit Well Line	1180	6
Access Midstream	New Albany, PA	Access Midstream	Mad Dog Well Line	555	10
PVR	Tunkhannock, PA	Michels Pipeline	Oliver Connection	1404	16
Sunoco	Detroit, MI	Otis Eastern	Tundra Drive	1148.78	8
Sunoco	Detroit, MI	Otis Eastern	Avon Road		8
Sunoco	Detroit, MI	Otis Eastern	Apple Lane	1648.7	8
Sunoco	Detroit, MI	Otis Eastern	Clinton River	721.18	8
Sunoco	Detroit, MI	Otis Eastern	Hwy 53	1297.85	8
Sunoco	Tiffin, OH	Otis Eastern	Swamp	2098	8
Sunoco	Kent, OH	Otis Eastern	Swamp	1351	10
Access Midstream	PA	Precision Pipeline	Stream-Vista Gathering	1292.6	16
Enterprise-Atex	OH	Rockford Corp.	Little Walnut River	1007	20
Enterprise-Atex	OH	Rockford Corp.	Scioto River	1022.5	20
Momentum	Washington, PA	Ajax	Wetland	1807	6

Southeast Directional Drilling
3117 North Cessna Avenue
Casa Grande, AZ 85122
Nov 2010 – Feb 2013

- Drill Rig Operator
- Oiler / Deck Hand

Memorable Projects

3200/36”	Salt Lake City, UT
3800/24”	Susquehanna River, PA
3200/18”	Ohio River
3500/20”	Alleghany River

Oz Directional Drilling

38220 N 103rd Place. Scottsdale, AZ 85262
Phone: 480-306-6570 Fax: 480-306-6504

Dwayne Osadchuk

Experience:

2008-Present	Oz Directional Drilling Inc., / Oz Directional Drilling Mexico S de RL de CV President and Owner Directional Drilling throughout North America, Canada, United States, Mexico
2002-Present	Ozzie Ice LLC President/ Owner Ice skating rink in Phoenix
1992 - 2002	Ozzie's Pipeline Padder, Inc. / Ozzie's Padder of North America, Inc. Senior Vice President-Director Over seen all subsidiary Companies, Ozzie's of Australia, Ozzie's of Germany, Ozzie's of South America,, Rockeater Inc., Ozzie's Directional Drilling, Ozzie's Technical Services,
1995 - 1997	Desert Pipeline Company President-Owner Directional drilling in Alaska from Purdue bay to Fairbanks
1980 - 1992 construction	Southeast Pipeline Contractors, Inc. Senior Vice President, Superintendent, Foreman and Operator on various projects. (Including all phases of pipeline construction) Off Shore construction of 10,000' of 12" pipeline for International Diving Services in CA Relocation of 1182' of 8" pipeline for Southern Pacific Pipe Lines in CA 4200' of 8" & 12" pipeline for Ashland Pipe Line Co. near St. Paul Park, MN 40 mi of 10" pipeline for Spartan Intrastate Pipeline Systems in MI 30,223' of 4 ", 3" & 2" pipeline for H.L. Brown in MI 38 mi of .6" pipeline for Eagleton Engineering Co in WY 19 miles of Gathering for Eagleton Engineering Co in WY Relocate 1900'/12" for Southern Pacific Pipe Lines in AZ Hydrotest, 113 miles of 8" for MAPCO in IL 23 miles of 8" pipeline for MAPCO in WY 4" Metering Station 10 miles take-up/relay for Southeast Gas Corporation in NV Test 18,250' of 6 & 10" for Pacific Gas & Electric in CA Test & Clean for Southern Pacific Pipe Lines in NV Test & Clean for Southern Pacific Pipe Lines in CA 10" water line for Pacific Gas & Electric in CA 112 miles of 20" C02 pipeline for Exxon Pipeline in WY Installed 10 mi of S-6" for Texaco, Inc. in CA

Oz Directional Drilling

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Installed 7100' / 8" take-up; 5700' / 8 & 10" for Chevron in CA
60 miles of 24" C02 pipeline in WY
130 miles of 20" for Enstar Natural Gas in AK
20 miles of 20" for Mountain Fuel Resources in UT
88 miles of 36" for Mountain Fuel Resources in WY
24 miles of 4" & 6" for MAPCO in WY
42" valve settings for Northern Natural Gas in MT & SD
140 miles of 6" MAPCO in WY
110 miles of 6" For MAPCO in WY
23 miles of 8" for MAPCO in WY
100 miles of 8" retest for MAPCO in MN

History of Osadchuk Companies

1965-1967	Central Pipeline and Cable / Mark
1968-1980	Natural Pipeline/ Mark
1978-1990	Southeast pipeline / Mark and Dwayne
1988-2001	Ozzie's Pipeline Padder / Mark, Dwayne and Velma
1992-2001	Ozzie's Pipeline testing and cleaning / Mark, Dwayne and Velma
1994-2001	Ozzie Pipeline Padder of Germany/ Mark, Dwayne and Velma
1995-1997	Desert Pipeline Inc. / Dwayne
1995-2001	Ozzie's Directional drilling / Mark, Dwayne and Velma
1995-2001	Ozzie's Pipeline Padder of Australia / Mark, Dwayne and Velma
1997-2001	Ozzie's Pipeline Technical and inspection services / Mark, Dwayne and Velma
2001	All companies were sold to Yorktown Financial Group / Mark, Dwayne and Velma
2002-2008	Retired consultants Southeast Directional Drilling /Mark
2002-Present	Ozzie Ice LLC /Dwayne
2008-present	Oz Directional Drilling / Mark and Dwayne

Major Milestones in the Directional Drilling Industry

1997	Introduces the world largest Directional drill rig 1,400,000 lbs. of Pull back
1998	Completes the longest Directional Drill 6,382 Feet under the Illinois River
1999	has 18 Large Directional drill rigs working
2000	Completes the Deepest Directional drill 860 feet in North America Nose Creek
1996-2001	Acquires 4 patents on Directional drilling down hole tools

Members of Associations PLCA DCA IPLOCA

Oz Directional Drilling

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Phone: 480-306-6570 Fax: 480-306-6504

Completed Directional Drills Prior to 2002

1000 ft. of 14"	Green river in Kent Washington
1000ft. of 10"	I-70, Four-Four Construction
1013ft. of 8"	Jefferson River - Touch America
1045 ft. of 16"	Nehalem Crossing in Mist Oregon
1045 ft. of 12"	Nehalem Crossing in Mist Oregon
1050 ft. of 8"	Blackfoot River - Touch America
1050 ft. of 8"	Blackfoot River - Touch America
1073 ft. of 12"	Woronzof Bluff-Conam Construction
1114 ft. of 24"	I-15 - Questar
1130 ft. of 12"	Hwy 101 & 19 Ave - Int'l FiberCom
1175 ft. of 12"	Railroad & Canal -Conoco
1183 ft. of 36"	Cannon River, Minnesota
1200ft. of 10"	Pacos River, Ozzie's Directional Drilling
1200 ft. of 10"	Cuzenovic, New York
1200 ft. of 6"	Widefield, Colorado
1215 ft. of 12"	Ship Creek- Conam Construction
1240 ft. of 7" HDPE Conduit	I-87 Exit 12, MFS Network Technologies
1264 ft. of 20"	San Juan River -Questar
1300 ft., of 3 line bundle 14",6",2"	Kalama river in Kalama, Washington
1318 ft. of 24"	north Platte River - Western Gas Resources
1338 ft. of 12"	Bear River - Conoco
1338 ft. of 16"	Animas River - MAPCO
1352 ft. of	Swift Creek Wetlands - Cardinal Pipeline

Oz Directional Drilling

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24"	
1397 ft. of 8"	Catawaba River - Piedmont Natural Gas
1468 ft. of 24"	Juniper Branch Wetlands - Cardinal Pipeline
1474 ft. of 16"	Colorado River - Four - Four
1474 ft. of 16"	Colorado River, Four-Four Construction
1479 ft. of 12"	Croyden, WY - Conoco
1480 ft. of 36"	Rock River - U.S. Pipeline
1480 ft. of 36"	Rock River, U.S. Pipeline
1497 ft. of 10"	Georgia - Level 3
1500 ft. of 30"	South fork Iowa River in Iowa
1500 ft. of 18"	Pedernales River - Driver Pipeline
1500 ft. of 10"	I-90 Thruway in New york
1506 ft. of 18"	Flat Creek - Driver Pipeline
1520 ft. of 12"	South Platte River - Duke Energy
1563 ft. of 10"	Creek - Level 3
1586 ft. of 36"	Prairie River - Terrace III, Murphy Bros.
160 ft. of 12"	Road - Conoco
1600 ft. of 36"	Expansion Projects, Sheehan Pipeline
1602 ft. of 24"	White Oak Wetlands - Cardinal Pipeline
1620 ft. of 8"	South Toe River - Piedmont Natural Gas
1698 ft. of 12"	I-80 & Railroad - Conoco
1800 ft. of 30"	Harding River in Iowa
1817 ft. of 24'	Fore River - Algonquin Gas Transmission
1870 ft. of	Jordan Road Wetlands - Cardinal Pipeline

Oz Directional Drilling

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24"	
1891 ft. of 30"	Dry Creek - Midcoast Energy
1909 ft. of 14"	Charles River - Algonquin Gas
1946 ft. of 24"	Guffy Branch Wetlands - Cardinal Pipeline
1963 ft. of 30"	Trico Ltd. -Midcoast Energy
1963 ft. of 30"	Trico Ltd. - Midcoast Energy
1995 ft. of 12"	Clearwater River - Colt Engineering
201 ft. of 12"	Exit 111, Hwy 84 - Conoco
2026 ft. of 10"	Best Friend Rd. - Level3
2064 ft. of 24"	Clearwater River - Colt Engineering
2067 ft. of 8"	Clark Fork River - Touch America
2077 ft. of 8"	Superior Drill - Touch America
2114 ft. of 12"	Tennessee River - Level 3
2139 ft. of 12"	I-80 - Conoco
2150 ft. of 36"	Indian Creek, U.S. Pipeline
2161 ft. of 36"	U.P. Railroad Crossing, Gregory & Cook
2170 ft. of 36"	Red Lake River - Lake Head Pipeline
2170 ft. of 36"	Red Lake River - U.S. Pipeline
2170 ft. of 36"	Red Lake River - Lake head Pipeline
2200 ft. of 36"	Mississippi River - Terrace III, Murphy Bros.
2254 ft. of 16'	Bitter Creek (2 Railroads) - Duke Energy
2280 ft. of 20"	Sacramento River - Williams Communications
2293 ft. of 8"	I-35 - Cap Rock Communications
2300 ft. of	Colorado Conservancy, Four-Four Construction

Oz Directional Drilling

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16"		
2300 ft. of 36"	Iowa River, Gregory & Cook	
2339 ft. of 24"	20th St & Parking Lot - CIG	
2387 ft. of 16"	Nature Conservancy, Mild America	
2400 ft. of 36"	Lake head Pipeline Terrace Expansion	
2428 ft. of 8"	Madison River - Touch America	
2500 ft. of 36"	Hwy 2, Terrace Phase III - Enbridge Energy	
2529 ft. of 16"	Wolf River, Wisconsin-village of Bonduel	
2534 ft. of 30"	Little Bear Creek - Midcoast Energy	
2534 ft. of 30"	Little Bear Creek - Midcoast Energy	
2769 ft. of 10"	Vulcan Rock Quarry - Level 3	
2780 ft. of 36"	Trans Colorado Gas	
2914 ft. of 36"	Des Plaines River- Joliet, Illinois	
300 ft. of 12"	Creek - Conoco	
3055 ft. of 8"	Platte River - Touch America	
3125 ft. of 36"	Des Plaines River - Northern Border	
3125 ft. of 36"	Des Plaines River, Pentzien	
3221 ft. of 8"	Wetlands, Iowa- Northern Hydrocarbons	
3360 ft. of 10"	Gila River - Level 3/ Kiewit western	
3412 ft. of 12"hdpe	Ohio River, Kentucky -Level3	
3960 ft. of 16"	Mid Mountain-Puget Sound	
347 Meters	Rio Champoton, Bechtel de Mexico	
360 Meters	Rio Chumpan,	Bechtel de Mexico
370 Meters	Rio Candeleria , Bechtel de Mexico	

Oz Directional Drilling

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Phone: 480-306-6570 Fax: 480-306-6504

3942 ft. of 16"	Several Crossings - Level 3
3960 ft. of 16"	Puget Sound Energy - Washington
404 Meters	Rio Tepetitan, Bechtel de Mexico
4490 ft. of 16"	Colorado Wetlands, Mild America
4702 ft. of 24"	Wetlands - Questar
523ft. of 8"	Hwy 18 & Wetlands - Piedmont Natural Gas
524 ft. of 10"	Sta. 938+25 to 943+49 - Level 3
555 ft. of 12"	Road - Conoco
5833 ft. of 8"	Nose Creek - Anderson Exploration
595 ft. of 8"	John's River - Piedmont Natural Gas
595 Meters	Rio Usumacinta, Bechtel de Mexico
600 ft. of 12"	Hwy 150 - Conoco
600 ft. of 12"	Goldsborough Creek - Cascade Natural Gas
6020 ft. of 18"	Clear Lake - Clear Lake Sanitary District
6380 ft. of 8"	Illinois River - TransMontaigne
640 ft. of six 2" Ducts	Blackfoot River (North) - Touch America
683 ft. of 8"	Linville River 2 - Piedmont Natural Gas
701 ft. of 4"	Linville River 1 - Piedmont Natural Gas
702 ft. of 8"	Upper Creek - Piedmont Natural Gas
724 ft. of 12"	Taunton River, Process Engineers & Constructors
779 ft. of 12"	Coyote Creek - Level 3/ Kiewit Pacific
780 ft. of 8"	North Toe River - Piedmont Natural Gas
793 ft. of 12"	Bridge on Spruce Pine - Piedmont Natural Gas
810 ft. of 1 1/4 Fiber Optic	Van Buren & Loop 202 - Nextel
822 ft. of 20"	Green River - Jonah Gas Gathering
840 ft. of six 2" Ducts	Exit 61n - Touch America
860 ft. of 12"	I-80 Rock Springs - Conoco

Oz Directional Drilling

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898 ft. of 16"	Green River - Western Gas
900 ft. of 24"	North Platte River - Western Gas
913 ft. of 12"	Gas/ Electric Lines- Conoco
918 ft. of 10'	Pleasant Hill Rd. - Level 3
918 ft. of Six 2" Ducts	I-90 - Touch America
923 ft. of 24"	PXP Sand Creek - Kinder Morgan Interstate
927 ft. of 10"	best Friend Rd. - Level 3
927 ft. of 10"	I-35 - Nextlink
960 ft. of 30"	Cane Creek - Midcoast Energy
968 ft. of 16"	San Juan River - MAPCO
990 ft. of Six 2" Ducts	Nine Mile Creek - Touch America
994 ft. of 20"	Clear Creel - CMS/ Okemah
Numerous Crossing of 10"	Level/ Kiewit Pacific
Numerous Crossings of 10"	Tennessee - Level 3/ Gilbert Southern
Numerous Crossings of 10"	California - Level 3/ Kiewit Pacific
Numerous Crossings of 10"	Arizona - Level 3/ Kiewit Western
Numerous Crossings of 10"	Arizona - Level 3/ Kiewit Western
Numerous Crossings of 8"	Broadwing Communications
Numerous Crossings of 4"-8"	Prudeau bay Alaska to fairbanks Alasks

Brent Johnson

337 65th St
Clear Lake, WI 54005

Experience

Oz Directional Drilling
38220 N 103rd Place
Scottsdale, AZ 85262
Ph: 602-617-1115
Superintendent
Dec 2009-Present

- Supervise daily operations.
- Drill rig Operator

Project List

OWNER	LOCATION	CONTRACTOR	CROSSING	Length	Size	Soils
Access Midstream	Towanda , PA	Encompass	King Unit Well Line	1180	6	Rock
Access Midstream	New Albany, PA	Access Midstream	Mad Dog Well Line	555	10	Rock
PVR	Tunkhannock, PA	Michels Pipeline	Oliver Connection	1404	16	Rock
Sunoco	Detroit, MI	Otis Eastern	Tundra Drive	1148.78	8	Rock
Sunoco	Detroit, MI	Otis Eastern	Avon Road		8	Rock
Sunoco	Detroit, MI	Otis Eastern	Apple Lane	1648.7	8	Rock
Sunoco	Detroit, MI	Otis Eastern	Clinton River	721.18	8	Rock
Sunoco	Detroit, MI	Otis Eastern	Hwy 53	1297.85	8	Rock
Sunoco	Tiffin, OH	Otis Eastern	Swamp	2098	8	Rock
Sunoco	Kent, OH	Otis Eastern	Swamp	1351	10	Rock
Access Midstream	PA	Precision Pipeline	Stream-Vista Gathering	1292.6	16	Rock
Enterprise-Atex	OH	Rockford Corp.	Little Walnut River	1007	20	Rock
Enterprise-Atex	OH	Rockford Corp.	Scioto River	1022.5	20	Rock
Momentum	Washington, PA	Ajax	Wetland	1807	6	Rock

Crestwood Resources	Portage City, OH	Infrasource	Wetland	1247	6	Rock
Momentum	WV	Momentum	CR 250	3005	20	Rock
Dominion	Tioga Cty, PA	Otis Eastern	Lick Run Rd.	1522	24	Rock
Access Midstream	Wyalusing	Precision Pipeline	SR 4007	2047	16	Rock
MarkWest	Washington, PA	Otis Eastern	SR 151	1965	10	Rock
Momentum	WV	Flint Energy Services	County Rd. 3	1846	16	Rock
Momentum	WV	Flint Energy Services	Lumberport Rd.	2457	16	Rock
South west	New Milford	Southwest	Stream	1221	12	Rock
MarkWest	Washington, PA	Price Gregory	Bigger Rd.	1380	10	Rock
MarkWest	Washington, PA	Price Gregory	Wheeling RR	1005	10	Rock
MarkWest	Washington, PA	Price Gregory	Lincoln Hwy	1856	10	Rock
MarkWest	Washington, PA	Price Gregory	Miller Run Rd.	720	10	Rock
Kinder Morgan	EL Paso, TX	Price Gregory	Border Crossing	1344	36	Sand
MarkWest	Washington, PA	Otis Eastern	I-70	948.33	20	Rock
Talisman	Rome, PA	Precision Pipeline	Wetland	1810	20	Rock
Talisman	Rome, PA	Precision Pipeline	Wetland	1812	16	Rock
PVR	Bradford Cty., PA	Precision Pipeline	West Branch	1956	12	Rock
Mark West	McDonald, PA	Ajax	Green Cove Rd.	1817	20	Rock
Access Midstream	Towanda , PA	Chesapeake	Battin	2550	16	Rock
Access Midstream	Towanda , PA	Chesapeake	Vandemark	2947	16	Rock
Access Midstream	Towanda , PA	Chesapeake	Crane-Sugar Run	2093	16	Rock
Chesapeake	Towanda , PA	Otis Eastern	Johnson Gathering	1174	12	Rock
Chesapeake	Towanda , PA	Otis Eastern	Johnson Gathering	1183	8	Rock
Chesapeake	Leroy, PA	ULS	Towanda Creek	850	10	Rock
Chesapeake	Leroy, PA	Oz Directional	Towanda Creek	1150	16	Rock
Talisman	Leraysville, PA	Precision Pipeline	Stream/Pike Egress Project	1460	20	Rock
Talisman	Leraysville, PA	Precision Pipeline	Stream/Pike Egress Project	1132	20	Rock

Talisman	Leraysville, PA	Precision Pipeline	Stream/Pike Egress Project	1256	16/6	Rock
Talisman	Leraysville, PA	Precision Pipeline	Stream/Pike Egress Project	1247	20	Rock
Talisman	Leraysville, PA	Precision Pipeline	Stream/Pike Egress Project	1925	16/6	Rock
Talisman	Leraysville, PA	Precision Pipeline	Stream/Pike Egress Project	1925	20	Rock
E.C.A.	Clearfield, PA	Mid Ohio Pipeline	National Forest Preserve	1230	16	Rock
Chesapeake	Leroy, PA	Oz Directional	Wright Gathering	1295	16	Rock
Chesapeake	Leroy, PA	Oz Directional	Wright Gathering	826	6	Rock
Anadarko	Trout Run, PA	Price Gregory	Warrensville Gathering	2388	24	Rock
Anadarko	Trout Run, PA	Price Gregory	Warrensville Gathering	3647	24	Rock
Chesapeake	Meshoppen, PA	Otis Eastern	Anthracite East Gathering	1220	12	Rock
Chesapeake	Meshoppen, PA	Otis Eastern	Anthracite East Gathering	1663	12	Rock
Talisman	Morshenville, PA	Precision Pipeline	Knight to Bowers	1878	20	Rock
Talisman	Morshenville, PA	Precision Pipeline	Knight to Bowers	1550	12	Rock
Talisman	Morshenville, PA	Precision Pipeline	Knight to Bowers	2235	20	Rock
Talisman	Morshenville, PA	Precision Pipeline	Knight to Bowers	2235	12	Rock
Talisman	Morshenville, PA	Precision Pipeline	Knight to Bowers	1030	20	Rock
Talisman	Morshenville, PA	Precision Pipeline	Knight to Bowers	1030	12	Rock
Mark West	McDonald, PA	Ajax		1380	12	Rock
Mark West	McDonald, PA	Ajax		1141	12	Rock
PVR	Steam Valley, PA	Otis Eastern		1344	30	Rock
PVR	Steam Valley, PA	Otis Eastern		1345	12	Rock
Anadarko	Trout Run, PA	Price Gregory	Warrensville Gathering	2790	24	Rock
EQT	Wellsboro, PA	Universal Pipeline		807	12	Rock
Chief/PVR	Penn Twp., PA	Otis Eastern	Kennsinger Gathering	809	16	Rock
Chief/PVR	Penn Twp., PA	Otis Eastern	Kennsinger Gathering	1325	16	Rock
Caiman	Martinsville, WV	Price Gregory	Monroe County Extension	774	16	Rock
Southwest Energy	Camptown,PA	Ajax		895	16	Rock
Southwest	Camptown,PA	Ajax		832	12	Rock

Energy						
EQT	PA	Integrity	Hurd Gathering Line	820	8	Rock
Williams	W. Mooreland Cty, PA	Mid Ohio Pipeline	Funk Gas line	1135	10	Rock
Southwest Energy	HERRICK TWP, PA	Southwest Energy	T-Unit	1104	16	Rock
Southwest Energy	HERRICK TWP, PA	Southwest Energy	T-Unit	1139	16	Rock
Southwest Energy	HERRICK TWP, PA	Southwest Energy	T-Unit	1075	12	Rock
Bluestone	Gibson, PA	Price Gregory		1005	16	Rock
Bluestone	Gibson, PA	Price Gregory		1006	12	Rock
Bluestone	Gibson, PA	Price Gregory		1001	16	Rock
Chesapeake	Towanda , PA	Chesapeake	Crane-Schaeffer's Notch	1836	16	Rock
Chesapeake	Towanda , PA	Chesapeake	Suber	1557	12	Rock
EQT	PA	EQT	Nite-S004	1323	12	Rock
PVR	Jersey Shore	Otis Eastern	West Branch	1100	12	Rock
Mark West	McDonald, PA	Ajax	Chase Gathering	1998	12	Rock
Chesapeake	Troy , PA	Otis Eastern	Up Dike Gathering	1488	6	Rock
CFE	Manzanillo, MX	Oz Directional Drilling	Intercoastal Waterway	2513	36	Cemented Sands
Energy Corporation of America	Clearfield, PA	Mid Ohio Pipeline	Trout run Creek	1180	12	Rock
Energy Corporation of America	Clearfield, PA	Mid Ohio Pipeline	Trout run Creek	1180	12	Rock
Norse	Morrisville, NY	Otis Eastern	Chenango river	1215	6	Rock
Laser Midstream	Windsor, NY	Otis Eastern	Wetland	729	16	Rock
Laser Midstream	Windsor, NY	Otis Eastern	Wetland	550	16	Rock
Laser Midstream	Windsor, NY	Otis Eastern	Wetland	607	16	Rock
Laser Midstream	Windsor, NY	Otis Eastern	Wetland	838	16	Rock
Laser Midstream	Windsor, NY	Otis Eastern	I-17 11 Degree side bend	1923	16	Rock
Laser Midstream	Windsor, NY	Otis Eastern	Wetland	801	16	Rock
Laser Midstream	Windsor, NY	Otis	Wetland	708	16	Rock

		Eastern				
Laser Midstream	Windsor, NY	Otis Eastern	Wetland	993	16	Rock
Laser Midstream	Windsor, NY	Otis Eastern	Wetland	806	16	Rock
Laser Midstream	Windsor, NY	Otis Eastern	Trowbridge Creek	1030	16	Rock
Laser Midstream	Windsor, NY	Otis Eastern	Wetland	1333	16	Rock
Williams	Milford, PA	Otis Eastern	Creek	780	12	Rock
Anadarko	Steam Valley, PA	Price Gregory	Larry's Creek	2000	16	Rock
Anadarko	Steam Valley, PA	Price Gregory	Larry's Creek	2025	16	Rock
Anadarko	Steam Valley, PA	Price Gregory	Wolf Run	2042	16	Rock
Anadarko	Steam Valley, PA	Price Gregory	Wendell Run	2241	16	Rock
Anadarko	Salladasburg, PA	Price Gregory	Larry's Creek	1894	24	Rock
Chesapeake	Canton, PA	Utility Line Services	Towanda Creek	1185	16	Rock
Chesapeake	Canton, PA	Utility Line Services	Towanda Creek	919	16	Rock
Chesapeake	Canton, PA	Otis Eastern	Towanda Creek/US220	1174	12	Rock
Chief Gathering LLC	Salladasburg, PA	Otis Eastern	Fork Rd & Larry's Creek	914	12	Rock
Chief Gathering LLC	Salladasburg, PA	Otis Eastern	Jobs Run Creek	742	12	Rock
Chief Gathering LLC	Salladasburg, PA	Otis Eastern	Hwy 287 & Larry's Creek	976	12	Rock
Chief Gathering LLC	Salladasburg, PA	Otis Eastern	Wetlands & Creek	705	12	Rock
Chesapeake	New Albany, PA	Otis Eastern	Wetlands & Creek	903	12	Rock
Chesapeake	New Albany, PA	Otis Eastern	Steam	912	12	Rock
TransCanada	Manzanillo,Colima,MX	TransCanada	Canal	2353	30	Rock
TransCanada	Manzanillo,Colima,MX	TransCanada	Palo Verde West	1994	30	sand
TransCanada	Manzanillo,Colima,MX	TransCanada	Palo Verde East	1544	30	sand

Frontier Pipeline
588 155th Ave
Somerset, WI 54025
Ph: 715-247-7350
Foreman
Jan 2005 – Dec. 2009

- Drill rig operator
- Helped in daily crew organization
- Ensured rig and auxiliary worked properly

OWNER	LOCATION	ST	Description	Length	Size	Soils
Metropolitan Council	White Bear Lake	MN	Residential Area	3450	28-inch	Clay
Metropolitan Council	White Bear Lake	MN	Residential Area	3350	28-inch	Clay
Metropolitan Council	White Bear Lake	MN	Residential Area	3325	28-inch	Clay
Metropolitan Council	White Bear Lake	MN	Residential Area	3500	28-inch	Cobble
Como Park Gof Course	St. Paul	MN	75-foot hill	600	30-inch	Sand
Metropolitan Council	White Bear Lake	MN	Residential Area	3350	28-inch	Clay
Metropolitan Council	White Bear Lake	MN	Residential Area	2200	28-inch	Clay
Northern Natural Gas	Joice	IA	Rice Lake	2400	36-inch	Rock
Northern Natural Gas	Joice	IA	Winnabago River	1800	36-inch	Rock
Northern Natural Gas	Joice	IA	Beaver Creek	1400	36-inch	Rock
Enbridge Energy	Hayward	WI	River	2500	20-inch	Rock
RWA	New Haven	CT	I-95/I-90	1004	42-inch	
Connecticut DOT	New Haven	CT	Harbor	1900	48-inch	Rock
Colorado Gas-EL Paso	Denver	CO	Interstate 470	1133	24-inch	
Colorado Gas-EL Paso	Denver	CO	Interstate 470	3059	24-inch	Clay
Colorado Gas-EL Paso	Denver	CO	Interstate 76	1418.6	24-inch	Clay
Connecticut DOT	New Haven	CT	Harbor	1900	48-inch	Rock
Northern Natural Gas	Joice	IA	Elk River Marsh	2341	36-inch	Rock
BP Pipelines	Toledo	OH	Bennet Road	1918	6-inch	
BP Pipelines	Toledo	OH	I-475	1178.3	6-inch	Rock
BP Pipelines	Toledo	OH	Detroit Ave	3825	6-inch	Rock

Credentials & Expertise

- Numerous safety certifications

Troubleshooting and repair for virtually all HDD equipment

Ryan Littlefield

50031 N. 27th Ave.
New River, AZ 85087

Experience

Oz Directional Drilling
38220 N 103rd Place
Scottsdale, AZ 85262
Ph: 480-703-2757
Vice President of Operations
Sept 2015-Present

- Responsible for planning and organizing all aspects of HDD field services.
- Responsible for acquiring the necessary equipment and materials pertaining to each individual project.
- Involvement in project bidding, pre-design, and record drawings.

Superintendent/Safety Coordinator
Aug 2008-Present

- Drill rig Operator
- Evaluate safety audits on crews and enforce OZDD safety standards
- Supervise daily operations.

Certifications:

- Authorized Veriforce OQ Testing Administrator
- OSHA 10 + 30
- OSHA 510
- OSHA 500 Trainer course
- 24 HR HAZWOPER
- NCCER Abnormal operating conditions
- Compitient person, Flagger, Confined Space, bloodborne pathogen, First Aid, CPR,

Project List

OWNER	LOCATION	CONTRACTOR	CROSSING	Length	Size
Access Midstream	Towanda , PA	Encompass	King Unit Well Line	1180	6
Access Midstream	New Albany, PA	Access Midstream	Mad Dog Well Line	555	10
PVR	Tunkhannock, PA	Michels Pipeline	Oliver Connection	1404	16
Sunoco	Detroit, MI	Otis Eastern	Tundra Drive	1148.78	8
Sunoco	Detroit, MI	Otis Eastern	Avon Road		8
Sunoco	Detroit, MI	Otis Eastern	Apple Lane	1648.7	8
Sunoco	Detroit, MI	Otis Eastern	Clinton River	721.18	8
Sunoco	Detroit, MI	Otis Eastern	Hwy 53	1297.85	8
Sunoco	Tiffin, OH	Otis Eastern	Swamp	2098	8
Sunoco	Kent, OH	Otis Eastern	Swamp	1351	10

Access Midstream	PA	Precision Pipeline	Stream-Vista Gathering	1292.6	16
Enterprise-Atex	OH	Rockford Corp.	Little Walnut River	1007	20
Enterprise-Atex	OH	Rockford Corp.	Scioto River	1022.5	20
Momentum	Washington, PA	Ajax	Wetland	1807	6
Crestwood Resources	Portage City, OH	Infrasource	Wetland	1247	6
Momentum	WV	Momentum	CR 250	3005	20
Dominion	Tioga Cty, PA	Otis Eastern	Lick Run Rd.	1522	24
Access Midstream	Wyalusing	Precision Pipeline	SR 4007	2047	16
MarkWest	Washington, PA	Otis Eastern	SR 151	1965	10
Momentum	WV	Flint Energy Services	County Rd. 3	1846	16
Momentum	WV	Flint Energy Services	Lumberport Rd.	2457	16
South west	New Milford	Southwest	Stream	1221	12
MarkWest	Washington, PA	Price Gregory	Bigger Rd.	1380	10
MarkWest	Washington, PA	Price Gregory	Wheeling RR	1005	10
MarkWest	Washington, PA	Price Gregory	Lincoln Hwy	1856	10
MarkWest	Washington, PA	Price Gregory	Miller Run Rd.	720	10
Kinder Morgan	EL Paso, TX	Price Gregory	Border Crossing	1344	36
MarkWest	Washington, PA	Otis Eastern	I-70	948.33	20
Talisman	Rome, PA	Precision Pipeline	Wetland	1810	20
Talisman	Rome, PA	Precision Pipeline	Wetland	1812	16
PVR	Bradford Cty., PA	Precision Pipeline	West Branch	1956	12
Mark West	McDonald, PA	Ajax	Green Cove Rd.	1817	20
Access Midstream	Towanda , PA	Chesapeake	Battin	2550	16
Access Midstream	Towanda , PA	Chesapeake	Vandemark	2947	16
Access Midstream	Towanda , PA	Chesapeake	Crane-Sugar Run	2093	16
Chesapeake	Towanda , PA	Otis Eastern	Johnson Gathering	1174	12
Chesapeake	Towanda , PA	Otis Eastern	Johnson Gathering	1183	8
Chesapeake	Leroy, PA	ULS	Towanda Creek	850	10
Chesapeake	Leroy, PA	Oz Directional	Towanda Creek	1150	16
Talisman	Leraysville, PA	Precision Pipeline	Stream/Pike Egress Project	1460	20
Talisman	Leraysville, PA	Precision Pipeline	Stream/Pike Egress Project	1132	20
Talisman	Leraysville, PA	Precision Pipeline	Stream/Pike Egress Project	1256	16/6
Talisman	Leraysville, PA	Precision Pipeline	Stream/Pike Egress Project	1247	20
Talisman	Leraysville, PA	Precision Pipeline	Stream/Pike Egress Project	1925	16/6
Talisman	Leraysville, PA	Precision Pipeline	Stream/Pike Egress Project	1925	20
E.C.A.	Clearfield, PA	Mid Ohio Pipeline	National Forest Preserve	1230	16
Chesapeake	Leroy, PA	Oz Directional	Wright Gathering	1295	16
Chesapeake	Leroy, PA	Oz Directional	Wright Gathering	826	6
Anadarko	Trout Run, PA	Price Gregory	Warrensville Gathering	2388	24
Anadarko	Trout Run, PA	Price Gregory	Warrensville Gathering	3647	24
Chesapeake	Meshoppen, PA	Otis Eastern	Anthracite East Gathering	1220	12

Chesapeake	Meshoppen, PA	Otis Eastern	Anthracite East Gathering	1663	12
Talisman	Morshenville, PA	Precision Pipeline	Knight to Bowers	1878	20
Talisman	Morshenville, PA	Precision Pipeline	Knight to Bowers	1550	12
Talisman	Morshenville, PA	Precision Pipeline	Knight to Bowers	2235	20
Talisman	Morshenville, PA	Precision Pipeline	Knight to Bowers	2235	12
Talisman	Morshenville, PA	Precision Pipeline	Knight to Bowers	1030	20
Talisman	Morshenville, PA	Precision Pipeline	Knight to Bowers	1030	12
Mark West	McDonald, PA	Ajax		1380	12
Mark West	McDonald, PA	Ajax		1141	12
PVR	Steam Valley, PA	Otis Eastern		1344	30
PVR	Steam Valley, PA	Otis Eastern		1345	12
Anadarko	Trout Run, PA	Price Gregory	Warrensville Gathering	2790	24
EQT	Wellsboro, PA	Universal Pipeline		807	12
Chief/PVR	Penn Twp., PA	Otis Eastern	Kennsinger Gathering	809	16
Chief/PVR	Penn Twp., PA	Otis Eastern	Kennsinger Gathering	1325	16
Caiman	Martinsville, WV	Price Gregory	Monroe County Extension	774	16
Southwest Energy	Camptown,PA	Ajax		895	16
Southwest Energy	Camptown,PA	Ajax		832	12
EQT	PA	Integrity	Hurd Gathering Line	820	8
Williams	W. Mooreland Cty, PA	Mid Ohio Pipeline	Funk Gas line	1135	10
Southwest Energy	HERRICK TWP, PA	Southwest Energy	T-Unit	1104	16
Southwest Energy	HERRICK TWP, PA	Southwest Energy	T-Unit	1139	16
Southwest Energy	HERRICK TWP, PA	Southwest Energy	T-Unit	1075	12
Bluestone	Gibson, PA	Price Gregory		1005	16
Bluestone	Gibson, PA	Price Gregory		1006	12
Bluestone	Gibson, PA	Price Gregory		1001	16
Chesapeake	Towanda , PA	Chesapeake	Crane-Schaeffer's Notch	1836	16
Chesapeake	Towanda , PA	Chesapeake	Suber	1557	12
EQT	PA	EQT	Nite-S004	1323	12
PVR	Jersey Shore	Otis Eastern	West Branch	1100	12
Mark West	McDonald, PA	Ajax	Chase Gathering	1998	12
Chesapeake	Troy , PA	Otis Eastern	Up Dike Gathering	1488	6
CFE	Manzanillo, MX	Oz Directional Drilling	Intercoastal Waterway	2513	36
Energy Corporation of America	Clearfield, PA	Mid-Ohio Pipeline	Trout run Creek	1180	12
Energy Corporation of America	Clearfield, PA	Mid-Ohio Pipeline	Trout run Creek	1180	12
Norse	Morrisville, NY	Otis Eastern	Chenango river	1215	6
Laser Midstream	Windsor, NY	Otis Eastern	Wetland	729	16
Laser Midstream	Windsor, NY	Otis Eastern	Wetland	550	16
Laser Midstream	Windsor, NY	Otis Eastern	Wetland	607	16
Laser Midstream	Windsor, NY	Otis Eastern	Wetland	838	16
Laser Midstream	Windsor, NY	Otis Eastern	I-17 11 Degree side bend	1923	16
Laser Midstream	Windsor, NY	Otis Eastern	Wetland	801	16

Laser Midstream	Windsor, NY	Otis Eastern	Wetland	708	16
Laser Midstream	Windsor, NY	Otis Eastern	Wetland	993	16
Laser Midstream	Windsor, NY	Otis Eastern	Wetland	806	16
Laser Midstream	Windsor, NY	Otis Eastern	Trowbridge Creek	1030	16
Laser Midstream	Windsor, NY	Otis Eastern	Wetland	1333	16
Williams	Milford, PA	Otis Eastern	Creek	780	12
Anadarko	Steam Valley, PA	Price Gregory	Larry's Creek	2000	16
Anadarko	Steam Valley, PA	Price Gregory	Larry's Creek	2025	16
Anadarko	Steam Valley, PA	Price Gregory	Wolf Run	2042	16
Anadarko	Steam Valley, PA	Price Gregory	Wendell Run	2241	16
Anadarko	Salladasburg, PA	Price Gregory	Larry's Creek	1894	24
Chesapeake	Canton, PA	Utility Line Services	Towanda Creek	1185	16
Chesapeake	Canton, PA	Utility Line Services	Towanda Creek	919	16
Chesapeake	Canton, PA	Otis Eastern	Towanda Creek/US220	1174	12
Chief Gathering LLC	Salladasburg, PA	Otis Eastern	Fork Rd & Larry's Creek	914	12
Chief Gathering LLC	Salladasburg, PA	Otis Eastern	Jobs Run Creek	742	12
Chief Gathering LLC	Salladasburg, PA	Otis Eastern	Hwy 287 & Larry's Creek	976	12
Chief Gathering LLC	Salladasburg, PA	Otis Eastern	Wetlands & Creek	705	12
Chesapeake	New Albany, PA	Otis Eastern	Wetlands & Creek	903	12
Chesapeake	New Albany, PA	Otis Eastern	Steam	912	12
TransCanada	Manzanillo,Colima,MX	TransCanada	Canal	2353	30
TransCanada	Manzanillo,Colima,MX	TransCanada	Palo Verde West	1994	30
TransCanada	Manzanillo,Colima,MX	TransCanada	Palo Verde East	1544	30
Chesapeake	Troy , Penn	Otis Eastern	Towanda Creek	850	16
Mark West	Atoka, Ok	Okemah	Bad Creek	1120	24
Mark West	Atoka, Ok	Okemah	Muddy Bog	4252	24
Kinder Morgan	Paris, TX	Henkel's & McCoy		4100	36
Consumers Power	Pontiac, MI	MN Limited	Dixie Hwy	3110	36
CYNOG	Canisteo ,NY	CYNOG	Canisteo River	2250	12
Oneok	Craig, CO	Sterling Construction	Yampa River5	1120	14
Oneok	Craig, CO	Sterling Construction	White River	1365	14
Oneok	Craig, CO	Sterling Construction	North Rock Bluff	661	14
Oneok	Craig, CO	Sterling Construction	South Rock Bluff	700	14
East Resources	Canton, PA	ULS	Able Creek	714	12
East Resources	Canton, PA	ULS	Ellenton Rd and Creek	1120	12
Cabot	Dimock PA	ULS	Meshoppen River	1200	10
Cabot	Dimock PA	ULS	Meshoppen River	600	10
Spectra	Taunton, MA	Otis Eastern	Taunton River	1200	10
Texas Gas	Searcy, AR	Associated Pipeline	White River	2285	36
Cabot	Dimock PA	ULS	Creek	944	10

Southeast Directional Drilling
3117 North Cessna Avenue

Casa Grande, AZ 85122
May 2008 – Aug. 2008

- Deck hand/Oiler

Projects

4000/24"	Canedegwa, NY
1800/24"	Pinedale, WY
1800/24"	Pinedale, WY
1800/24"	Pinedale, WY
2200/24"	Fontenelle, WY
2600/24"	Citronelle, AL

Carson and Roberts
171 Route 94
Lafayette, NJ 07848
April 2008 – May. 2008

- Deck hand/Oiler

Projects

3600/24"	Owego, NY

Ricardo Chacon

Buckeye, Arizona

Employment History:

Osha 10 hour Safety Training

8-2008- Present Oz Directional Drilling Forman/Driller

OWNER	CONTRACTOR	CROSSING	Length	Size	Soils
Access Midstream	Encompass	King Unit Well Line	1180	6	Rock
Access Midstream	Access Midstream	Mad Dog Well Line	555	10	Rock
PVR	Michels Pipeline	Oliver Connection	1404	16	Rock
Sunoco	Otis Eastern	Tundra Drive	1148.78	8	Rock
Sunoco	Otis Eastern	Avon Road		8	Rock
Sunoco	Otis Eastern	Apple Lane	1648.7	8	Rock
Sunoco	Otis Eastern	Clinton River	721.18	8	Rock
Sunoco	Otis Eastern	Hwy 53	1297.85	8	Rock
Sunoco	Otis Eastern	Swamp	2098	8	Rock
Sunoco	Otis Eastern	Swamp	1351	10	Rock
Access Midstream	Precision Pipeline	Stream-Vista Gathering	1292.6	16	Rock
Enterprise-Atex	Rockford Corp.	Little Walnut River	1007	20	Rock
Enterprise-Atex	Rockford Corp.	Scioto River	1022.5	20	Rock
Momentum	Ajax	Wetland	1807	6	Rock
Crestwood Resources	Infrasource	Wetland	1247	6	Rock
Momentum	Momentum	CR 250	3005	20	Rock
Dominion	Otis Eastern	Lick Run Rd.	1522	24	Rock
Access Midstream	Precision Pipeline	SR 4007	2047	16	Rock
MarkWest	Otis Eastern	SR 151	1965	10	Rock
Momentum	Flint Energy Services	County Rd. 3	1846	16	Rock
Momentum	Flint Energy Services	Lumberport Rd.	2457	16	Rock
South west	Southwest	Stream	1221	12	Rock
MarkWest	Price Gregory	Bigger Rd.	1380	10	Rock
MarkWest	Price Gregory	Wheeling RR	1005	10	Rock
MarkWest	Price Gregory	Lincoln Hwy	1856	10	Rock
MarkWest	Price Gregory	Miller Run Rd.	720	10	Rock
Kinder Morgan	Price Gregory	Border Crossing	1344	36	Sand
MarkWest	Otis Eastern	I-70	948.33	20	Rock
Talisman	Precision Pipeline	Wetland	1810	20	Rock
Talisman	Precision Pipeline	Wetland	1812	16	Rock
PVR	Precision Pipeline	West Branch	1956	12	Rock
Mark West	Ajax	Green Cove Rd.	1817	20	Rock
Access Midstream	Chesapeake	Battin	2550	16	Rock

Access Midstream	Chesapeake	Vandemark	2947	16	Rock
Access Midstream	Chesapeake	Crane-Sugar Run	2093	16	Rock
Chesapeake	Otis Eastern	Johnson Gathering	1174	12	Rock
Chesapeake	Otis Eastern	Johnson Gathering	1183	8	Rock
Chesapeake	ULS	Towanda Creek	850	10	Rock
Chesapeake	Oz Directional	Towanda Creek	1150	16	Rock
Talisman	Precision Pipeline	Stream/Pike Egress Project	1460	20	Rock
Talisman	Precision Pipeline	Stream/Pike Egress Project	1132	20	Rock
Talisman	Precision Pipeline	Stream/Pike Egress Project	1256	16/6	Rock
Talisman	Precision Pipeline	Stream/Pike Egress Project	1247	20	Rock
Talisman	Precision Pipeline	Stream/Pike Egress Project	1925	16/6	Rock
Talisman	Precision Pipeline	Stream/Pike Egress Project	1925	20	Rock
E.C.A.	Mid Ohio Pipeline	National Forest Preserve	1230	16	Rock
Chesapeake	Oz Directional	Wright Gathering	1295	16	Rock
Chesapeake	Oz Directional	Wright Gathering	826	6	Rock
Anadarko	Price Gregory	Warrensville Gathering	2388	24	Rock
Anadarko	Price Gregory	Warrensville Gathering	3647	24	Rock
Chesapeake	Otis Eastern	Anthracite East Gathering	1220	12	Rock
Chesapeake	Otis Eastern	Anthracite East Gathering	1663	12	Rock
Talisman	Precision Pipeline	Knight to Bowers	1878	20	Rock
Talisman	Precision Pipeline	Knight to Bowers	1550	12	Rock
Talisman	Precision Pipeline	Knight to Bowers	2235	20	Rock
Talisman	Precision Pipeline	Knight to Bowers	2235	12	Rock
Talisman	Precision Pipeline	Knight to Bowers	1030	20	Rock
Talisman	Precision Pipeline	Knight to Bowers	1030	12	Rock
Mark West	Ajax		1380	12	Rock
Mark West	Ajax		1141	12	Rock
PVR	Otis Eastern		1344	30	Rock
PVR	Otis Eastern		1345	12	Rock
Anadarko	Price Gregory	Warrensville Gathering	2790	24	Rock
EQT	Universal Pipeline		807	12	Rock
Chief/PVR	Otis Eastern	Kennsinger Gathering	809	16	Rock
Chief/PVR	Otis Eastern	Kennsinger Gathering	1325	16	Rock
Caiman	Price Gregory	Monroe County Extension	774	16	Rock
Southwest Energy	Ajax		895	16	Rock
Southwest Energy	Ajax		832	12	Rock
EQT	Integrity	Hurd Gathering Line	820	8	Rock
Williams	Mid Ohio Pipeline	Funk Gas line	1135	10	Rock
Southwest Energy	Southwest Energy	T-Unit	1104	16	Rock
Southwest Energy	Southwest Energy	T-Unit	1139	16	Rock
Southwest Energy	Southwest Energy	T-Unit	1075	12	Rock

Bluestone	Price Gregory		1005	16	Rock
Bluestone	Price Gregory		1006	12	Rock
Bluestone	Price Gregory		1001	16	Rock
Chesapeake	Chesapeake	Crane-Schaeffer's Notch	1836	16	Rock
Chesapeake	Chesapeake	Suber	1557	12	Rock
EQT	EQT	Nite-S004	1323	12	Rock
PVR	Otis Eastern	West Branch	1100	12	Rock
Mark West	Ajax	Chase Gathering	1998	12	Rock
Chesapeake	Otis Eastern	Up Dike Gathering	1488	6	Rock
CFE	Oz Directional Drilling	Intercoastal Waterway	2513	36	Rock
Energy Corporation of America	Mid Ohio Pipeline	Trout run Creek	1180	12	Rock
Energy Corporation of America	Mid Ohio Pipeline	Trout run Creek	1180	12	Rock
Norse	Otis Eastern	Chenango river	1215	6	Rock
Laser Midstream	Otis Eastern	Wetland	729	16	Rock
Laser Midstream	Otis Eastern	Wetland	550	16	Rock
Laser Midstream	Otis Eastern	Wetland	607	16	Rock
Laser Midstream	Otis Eastern	Wetland	838	16	Rock
Laser Midstream	Otis Eastern	I-17 11 Degree side bend	1923	16	Rock
Laser Midstream	Otis Eastern	Wetland	801	16	Rock
Laser Midstream	Otis Eastern	Wetland	708	16	Rock
Laser Midstream	Otis Eastern	Wetland	993	16	Rock
Laser Midstream	Otis Eastern	Wetland	806	16	Rock
Laser Midstream	Otis Eastern	Trowbridge Creek	1030	16	Rock
Laser Midstream	Otis Eastern	Wetland	1333	16	Rock
Williams	Otis Eastern	Creek	780	12	Rock
Anadarko	Price Gregory	Larry's Creek	2000	16	Rock
Anadarko	Price Gregory	Larry's Creek	2025	16	Rock
Anadarko	Price Gregory	Wolf Run	2042	16	Rock
Anadarko	Price Gregory	Wendell Run	2241	16	Rock
Anadarko	Price Gregory	Larry's Creek	1894	24	Rock
Chesapeake	Utility Line Services	Towanda Creek	1185	16	Rock
Chesapeake	Utility Line Services	Towanda Creek	919	16	Rock
Chesapeake	Otis Eastern	Towanda Creek/US220	1174	12	Rock
Chief Gathering LLC	Otis Eastern	Fork Rd & Larry's Creek	914	12	Rock
Chief Gathering LLC	Otis Eastern	Jobs Run Creek	742	12	Rock
Chief Gathering LLC	Otis Eastern	Hwy 287 & Larry's Creek	976	12	Rock
Chief Gathering LLC	Otis Eastern	Wetlands & Creek	705	12	Rock
Chesapeake	Otis Eastern	Wetlands & Creek	903	12	Rock
Chesapeake	Otis Eastern	Steam	912	12	Rock
TransCanada	TransCanada	Canal	2353	30	Rock
TransCanada	TransCanada	Palo Verde West	1994	30	sand
TransCanada	TransCanada	Palo Verde East	1544	30	sand
Chesapeake	Otis Eastern	Towanda Creek	850	16	Rock

Mark West	Okemah	Bad Creek	1120	24	Rock
Mark West	Okemah	Muddy Bog	4252	24	Rock
Kinder Morgan	Henkel's & McCoy		4100	36	
Consumers Power	MN Limited	Dixie Hwy	3110	36	
CYNOG	CYNOG	Canisteo River	2250	12	
Oneok	Sterling Construction	Yampa River5	1120	14	Rock
Oneok	Sterling Construction	White River	1365	14	Rock
Oneok	Sterling Construction	North Rock Bluff	661	14	Rock
Oneok	Sterling Construction	South Rock Bluff	700	14	Rock
East Resources	ULS	Able Creek	714	12	Rock
East Resources	ULS	Ellenton Rd and Creek	1120	12	Rock
Cabot	ULS	Meshoppen River	1200	10	Rock
Cabot	ULS	Meshoppen River	600	10	Rock
Spectra	Otis Eastern	Taunton River	1200	10	Soils
Texas Gas	Associated Pipeline	White River	2285	36	Soils
Cabot	ULS	Creek	944	10	Rock

2002-2008 Southeast Drilling Forman/Driller

1,200/24"	Canadago -NY- Otis Eastern
3,500/24"	Susquehanna River - CNOYG-NY
2,000/30"	Minnesota Limited
Numerous Crossings of 24"	Fishel. Pipeline Arizona
Numerous Crossings of 24"	Arizona, Rock 4 Pipeline
Numerous Crossings of 8"-24"	El Paso TX, Kinder/Morgan
Numerous Crossings of 42"	TX Sheehan
Numerous Crossings of 42"	Monroe LA, Sheehan
Numerous Crossings of 30"	Wyoming, US Pipeline

1996-2002 Ozzie's Directional Drilling Labor/Mudman/Operator/Driller

Numerous Crossing of 10"	Level/ Kiewit Pacific
Numerous Crossing of 10"	Tennessee - Level 3/ Gilbert Southern
Numerous Crossing of 10"	Arizona - Level 3/ Kiewit Western
Numerous Crossing of 10"	California - Level 3/ Kiewit Pacific
Numerous Crossing of 10"	Arizona - Level 3/ Kiewit Western
Numerous Crossing of 8"	Broadwing Communications
Numerous Crossings of 4"-8"	Prudeau bay Alaska to fairbanks Alasks
1200ft. of 10"	Pacos River, Ozzie's Directional Drilling
2067 ft. of 8"	Clark Fork River - Touch America
2114 ft. of 12"	Tennessee River - Level 3
2150 ft. of 36"	Indian Creek, U.S. Pipeline
2161 ft. of 36"	U.P. Railroad Crossing, Gregory & Cook
2170 ft. of 36"	Red Lake River - Lake Head Pipeline
2254 ft. of 16'	Bitter Creek (2 Railroads) - Duke Energy
3221 ft. of 8"	Wetlands, Iowa- Northern Hydrocarbons

3412 ft. of 12"hdpe	Ohio River, Kentucky -Level3
4490 ft. of 16"	Coorado Wetlands, Mild America
5833 ft. of 8"	Nose Creek - Anderson Exploration

References:	Mark Osadchuk	602-738-1312
	Dwayne Osadchuk	602-617-1115

Roman Sanchez
Phoenix, Az

EMPLOYMENT HISTORY

8-2008- Present Oz Directional Drilling Forman

OWNER	CONTRACTOR	CROSSING	Length	Size	Soils
Access Midstream	Encompass	King Unit Well Line	1180	6	Rock
Access Midstream	Access Midstream	Mad Dog Well Line	555	10	Rock
PVR	Michels Pipeline	Oliver Connection	1404	16	Rock
Sunoco	Otis Eastern	Tundra Drive	1148.78	8	Rock
Sunoco	Otis Eastern	Avon Road		8	Rock
Sunoco	Otis Eastern	Apple Lane	1648.7	8	Rock
Sunoco	Otis Eastern	Clinton River	721.18	8	Rock
Sunoco	Otis Eastern	Hwy 53	1297.85	8	Rock
Sunoco	Otis Eastern	Swamp	2098	8	Rock
Sunoco	Otis Eastern	Swamp	1351	10	Rock
Access Midstream	Precision Pipeline	Stream-Vista Gathering	1292.6	16	Rock
Enterprise-Atex	Rockford Corp.	Little Walnut River	1007	20	Rock
Enterprise-Atex	Rockford Corp.	Scioto River	1022.5	20	Rock
Momentum	Ajax	Wetland	1807	6	Rock
Crestwood Resources	Infrasource	Wetland	1247	6	Rock
Momentum	Momentum	CR 250	3005	20	Rock
Dominion	Otis Eastern	Lick Run Rd.	1522	24	Rock
Access Midstream	Precision Pipeline	SR 4007	2047	16	Rock
MarkWest	Otis Eastern	SR 151	1965	10	Rock
Momentum	Flint Energy Services	County Rd. 3	1846	16	Rock
Momentum	Flint Energy Services	Lumberport Rd.	2457	16	Rock
South west	Southwest	Stream	1221	12	Rock
MarkWest	Price Gregory	Bigger Rd.	1380	10	Rock
MarkWest	Price Gregory	Wheeling RR	1005	10	Rock
MarkWest	Price Gregory	Lincoln Hwy	1856	10	Rock
MarkWest	Price Gregory	Miller Run Rd.	720	10	Rock
Kinder Morgan	Price Gregory	Border Crossing	1344	36	Sand
MarkWest	Otis Eastern	I-70	948.33	20	Rock
Talisman	Precision Pipeline	Wetland	1810	20	Rock
Talisman	Precision Pipeline	Wetland	1812	16	Rock
PVR	Precision Pipeline	West Branch	1956	12	Rock
Mark West	Ajax	Green Cove Rd.	1817	20	Rock
Access Midstream	Chesapeake	Battin	2550	16	Rock
Access Midstream	Chesapeake	Vandemark	2947	16	Rock
Access Midstream	Chesapeake	Crane-Sugar Run	2093	16	Rock

Chesapeake	Otis Eastern	Johnson Gathering	1174	12	Rock
Chesapeake	Otis Eastern	Johnson Gathering	1183	8	Rock
Chesapeake	ULS	Towanda Creek	850	10	Rock
Chesapeake	Oz Directional	Towanda Creek	1150	16	Rock
Talisman	Precision Pipeline	Stream/Pike Egress Project	1460	20	Rock
Talisman	Precision Pipeline	Stream/Pike Egress Project	1132	20	Rock
Talisman	Precision Pipeline	Stream/Pike Egress Project	1256	16/6	Rock
Talisman	Precision Pipeline	Stream/Pike Egress Project	1247	20	Rock
Talisman	Precision Pipeline	Stream/Pike Egress Project	1925	16/6	Rock
Talisman	Precision Pipeline	Stream/Pike Egress Project	1925	20	Rock
E.C.A.	Mid Ohio Pipeline	National Forest Preserve	1230	16	Rock
Chesapeake	Oz Directional	Wright Gathering	1295	16	Rock
Chesapeake	Oz Directional	Wright Gathering	826	6	Rock
Anadarko	Price Gregory	Warrensville Gathering	2388	24	Rock
Anadarko	Price Gregory	Warrensville Gathering	3647	24	Rock
Chesapeake	Otis Eastern	Anthracite East Gathering	1220	12	Rock
Chesapeake	Otis Eastern	Anthracite East Gathering	1663	12	Rock
Talisman	Precision Pipeline	Knight to Bowers	1878	20	Rock
Talisman	Precision Pipeline	Knight to Bowers	1550	12	Rock
Talisman	Precision Pipeline	Knight to Bowers	2235	20	Rock
Talisman	Precision Pipeline	Knight to Bowers	2235	12	Rock
Talisman	Precision Pipeline	Knight to Bowers	1030	20	Rock
Talisman	Precision Pipeline	Knight to Bowers	1030	12	Rock
Mark West	Ajax		1380	12	Rock
Mark West	Ajax		1141	12	Rock
PVR	Otis Eastern		1344	30	Rock
PVR	Otis Eastern		1345	12	Rock
Anadarko	Price Gregory	Warrensville Gathering	2790	24	Rock
EQT	Universal Pipeline		807	12	Rock
Chief/PVR	Otis Eastern	Kennsinger Gathering	809	16	Rock
Chief/PVR	Otis Eastern	Kennsinger Gathering	1325	16	Rock
Caiman	Price Gregory	Monroe County Extension	774	16	Rock
Southwest Energy	Ajax		895	16	Rock
Southwest Energy	Ajax		832	12	Rock
EQT	Integrity	Hurd Gathering Line	820	8	Rock
Williams	Mid Ohio Pipeline	Funk Gas line	1135	10	Rock
Southwest Energy	Southwest Energy	T-Unit	1104	16	Rock
Southwest Energy	Southwest Energy	T-Unit	1139	16	Rock
Southwest Energy	Southwest Energy	T-Unit	1075	12	Rock
Bluestone	Price Gregory		1005	16	Rock
Bluestone	Price Gregory		1006	12	Rock

Bluestone	Price Gregory		1001	16	Rock
Chesapeake	Chesapeake	Crane-Schaeffer's Notch	1836	16	Rock
Chesapeake	Chesapeake	Suber	1557	12	Rock
EQT	EQT	Nite-S004	1323	12	Rock
PVR	Otis Eastern	West Branch	1100	12	Rock
Mark West	Ajax	Chase Gathering	1998	12	Rock
Chesapeake	Otis Eastern	Up Dike Gathering	1488	6	Rock
CFE	Oz Directional Drilling	Intercoastal Waterway	2513	36	Rock
Energy Corporation of America	Mid Ohio Pipeline	Trout run Creek	1180	12	Rock
Energy Corporation of America	Mid Ohio Pipeline	Trout run Creek	1180	12	Rock
Norse	Otis Eastern	Chenango river	1215	6	Rock
Laser Midstream	Otis Eastern	Wetland	729	16	Rock
Laser Midstream	Otis Eastern	Wetland	550	16	Rock
Laser Midstream	Otis Eastern	Wetland	607	16	Rock
Laser Midstream	Otis Eastern	Wetland	838	16	Rock
Laser Midstream	Otis Eastern	I-17 11 Degree side bend	1923	16	Rock
Laser Midstream	Otis Eastern	Wetland	801	16	Rock
Laser Midstream	Otis Eastern	Wetland	708	16	Rock
Laser Midstream	Otis Eastern	Wetland	993	16	Rock
Laser Midstream	Otis Eastern	Wetland	806	16	Rock
Laser Midstream	Otis Eastern	Trowbridge Creek	1030	16	Rock
Laser Midstream	Otis Eastern	Wetland	1333	16	Rock
Williams	Otis Eastern	Creek	780	12	Rock
Anadarko	Price Gregory	Larry's Creek	2000	16	Rock
Anadarko	Price Gregory	Larry's Creek	2025	16	Rock
Anadarko	Price Gregory	Wolf Run	2042	16	Rock
Anadarko	Price Gregory	Wendell Run	2241	16	Rock
Anadarko	Price Gregory	Larry's Creek	1894	24	Rock
Chesapeake	Utility Line Services	Towanda Creek	1185	16	Rock
Chesapeake	Utility Line Services	Towanda Creek	919	16	Rock
Chesapeake	Otis Eastern	Towanda Creek/US220	1174	12	Rock
Chief Gathering LLC	Otis Eastern	Fork Rd & Larry's Creek	914	12	Rock
Chief Gathering LLC	Otis Eastern	Jobs Run Creek	742	12	Rock
Chief Gathering LLC	Otis Eastern	Hwy 287 & Larry's Creek	976	12	Rock
Chief Gathering LLC	Otis Eastern	Wetlands & Creek	705	12	Rock
Chesapeake	Otis Eastern	Wetlands & Creek	903	12	Rock
Chesapeake	Otis Eastern	Steam	912	12	Rock
TransCanada	TransCanada	Canal	2353	30	Rock
TransCanada	TransCanada	Palo Verde West	1994	30	sand
TransCanada	TransCanada	Palo Verde East	1544	30	sand
Chesapeake	Otis Eastern	Towanda Creek	850	16	Rock
Mark West	Okemah	Bad Creek	1120	24	Rock
Mark West	Okemah	Muddy Bog	4252	24	Rock

Kinder Morgan	Henkel's & McCoy		4100	36	
Consumers Power	MN Limited	Dixie Hwy	3110	36	
CYNOG	CYNOG	Canisteo River	2250	12	
Oneok	Sterling Construction	Yampa River5	1120	14	Rock
Oneok	Sterling Construction	White River	1365	14	Rock
Oneok	Sterling Construction	North Rock Bluff	661	14	Rock
Oneok	Sterling Construction	South Rock Bluff	700	14	Rock
East Resources	ULS	Able Creek	714	12	Rock
East Resources	ULS	Ellenton Rd and Creek	1120	12	Rock
Cabot	ULS	Meshoppen River	1200	10	Rock
Cabot	ULS	Meshoppen River	600	10	Rock
Spectra	Otis Eastern	Taunton River	1200	10	Soils
Texas Gas	Associated Pipeline	White River	2285	36	Soils
Cabot	ULS	Creek	944	10	Rock

gies

Jeff Simon

2213 90th Ave
Osceola, WI 54020

Experience

Oz Directional Drilling
38220 N 103rd Place
Scottsdale, AZ 85262
Ph: 602-617-1115
Foreman
March 2012-Present

- Supervise daily operations.

Project List

OWNER	LOCATION	CONTRACTOR	CROSSING	Length	Size	Soils
Access Midstream	Towanda , PA	Encompass	King Unit Well Line	1180	6	Rock
Access Midstream	New Albany, PA	Access Midstream	Mad Dog Well Line	555	10	Rock
PVR	Tunkhannock, PA	Michels Pipeline	Oliver Connection	1404	16	Rock
Sunoco	Detroit, MI	Otis Eastern	Tundra Drive	1148.78	8	Rock
Sunoco	Detroit, MI	Otis Eastern	Avon Road		8	Rock
Sunoco	Detroit, MI	Otis Eastern	Apple Lane	1648.7	8	Rock
Sunoco	Detroit, MI	Otis Eastern	Clinton River	721.18	8	Rock
Sunoco	Detroit, MI	Otis Eastern	Hwy 53	1297.85	8	Rock
Sunoco	Tiffin, OH	Otis Eastern	Swamp	2098	8	Rock
Sunoco	Kent, OH	Otis Eastern	Swamp	1351	10	Rock
Access Midstream	PA	Precision Pipeline	Stream-Vista Gathering	1292.6	16	Rock
Enterprise-Atex	OH	Rockford Corp.	Little Walnut River	1007	20	Rock
Enterprise-Atex	OH	Rockford Corp.	Scioto River	1022.5	20	Rock
Momentum	Washington, PA	Ajax	Wetland	1807	6	Rock
Crestwood Resources	Portage City, OH	Infrasource	Wetland	1247	6	Rock
Momentum	WV	Momentum	CR 250	3005	20	Rock
Dominion	Tioga Cty, PA	Otis Eastern	Lick Run Rd.	1522	24	Rock
Access Midstream	Wyalusing	Precision Pipeline	SR 4007	2047	16	Rock
MarkWest	Washington, PA	Otis Eastern	SR 151	1965	10	Rock
Momentum	WV	Flint Energy Services	County Rd. 3	1846	16	Rock
Momentum	WV	Flint Energy Services	Lumberport Rd.	2457	16	Rock
South west	New Milford	Southwest	Stream	1221	12	Rock
MarkWest	Washington, PA	Price Gregory	Bigger Rd.	1380	10	Rock
MarkWest	Washington, PA	Price Gregory	Wheeling RR	1005	10	Rock
MarkWest	Washington, PA	Price Gregory	Lincoln Hwy	1856	10	Rock

MarkWest	Washington, PA	Price Gregory	Miller Run Rd.	720	10	Rock
Kinder Morgan	EL Paso, TX	Price Gregory	Border Crossing	1344	36	Sand
MarkWest	Washington, PA	Otis Eastern	I-70	948.33	20	Rock
Talisman	Rome, PA	Precision Pipeline	Wetland	1810	20	Rock
Talisman	Rome, PA	Precision Pipeline	Wetland	1812	16	Rock
PVR	Bradford Cty., PA	Precision Pipeline	West Branch	1956	12	Rock
Mark West	McDonald, PA	Ajax	Green Cove Rd.	1817	20	Rock
Access Midstream	Towanda , PA	Chesapeake	Battin	2550	16	Rock
Access Midstream	Towanda , PA	Chesapeake	Vandemark	2947	16	Rock
Access Midstream	Towanda , PA	Chesapeake	Crane-Sugar Run	2093	16	Rock
Chesapeake	Towanda , PA	Otis Eastern	Johnson Gathering	1174	12	Rock
Chesapeake	Towanda , PA	Otis Eastern	Johnson Gathering	1183	8	Rock
Chesapeake	Leroy, PA	ULS	Towanda Creek	850	10	Rock
Chesapeake	Leroy, PA	Oz Directional	Towanda Creek	1150	16	Rock
Talisman	Leraysville, PA	Precision Pipeline	Stream/Pike Egress Project	1460	20	Rock
Talisman	Leraysville, PA	Precision Pipeline	Stream/Pike Egress Project	1132	20	Rock
Talisman	Leraysville, PA	Precision Pipeline	Stream/Pike Egress Project	1256	16/6	Rock
Talisman	Leraysville, PA	Precision Pipeline	Stream/Pike Egress Project	1247	20	Rock
Talisman	Leraysville, PA	Precision Pipeline	Stream/Pike Egress Project	1925	16/6	Rock
Talisman	Leraysville, PA	Precision Pipeline	Stream/Pike Egress Project	1925	20	Rock

Southeast Directional Drilling
3117 North Cessna Avenue
Casa Grande, AZ 85122
Foreman
January 2010 – March 2012

- Supervise daily operations.

Frontier Pipeline
588 155th Ave
Somerset, WI 54025
Ph: 715-247-7350
Foreman/Operator
Jan 2005 – Dec. 2009

- Drill rig operator
- Helped in daily crew organization
- Ensured rig and auxiliary worked properly

OWNER	LOCATION	ST	Description	Length	Size	Soils
Metropolitan Council	White Bear Lake	MN	Residential Area	3450	28-inch	Clay
Metropolitan Council	White Bear Lake	MN	Residential Area	3350	28-inch	Clay
Metropolitan Council	White Bear Lake	MN	Residential Area	3325	28-inch	Clay
Metropolitan Council	White Bear Lake	MN	Residential Area	3500	28-inch	Cobble
Como Park Gof Course	St. Paul	MN	75-foot hill	600	30-inch	Sand
Metropolitan Council	White Bear Lake	MN	Residential Area	3350	28-inch	Clay
Metropolitan Council	White Bear Lake	MN	Residential Area	2200	28-inch	Clay
Northern Natural Gas	Joice	IA	Rice Lake	2400	36-inch	Rock
Northern Natural Gas	Joice	IA	Winnabago River	1800	36-inch	Rock
Northern Natural Gas	Joice	IA	Beaver Creek	1400	36-inch	Rock
Exxon Mobil-Golden Pass Project	Port Arthur	TX	Canal/wetlands	3515	42-inch	
Enbridge Energy	Hayward	WI	River	2500	20-inch	Rock
Exxon Mobil-Golden Pass Project	Port Arthur	TX	Canal/wetlands	4367	42-inch	
RWA	New Haven	CT	I-95/I-90	1004	42-inch	
Connecticut DOT	New Haven	CT	Harbor	1900	48-inch	Rock
Colorado Gas-EL Paso	Denver	CO	Interstate 470	1133	24-inch	
Colorado Gas-EL Paso	Denver	CO	Interstate 470	3059	24-inch	Clay
Colorado Gas-EL Paso	Denver	CO	Interstate 76	1418.6	24-inch	Clay
Connecticut DOT	New Haven	CT	Harbor	1900	48-inch	Rock
Northern Natural Gas	Joice	IA	Elk River Marsh	2341	36-inch	Rock
BP Pipelines	Toledo	OH	Bennet Road	1918	6-inch	
BP Pipelines	Toledo	OH	I-475	1178.3	6-inch	Rock
BP Pipelines	Toledo	OH	Detroit Ave	3825	6-inch	Rock

Credentials & Expertise

- Numerous safety certifications

Troubleshooting and repair for virtually all HDD equipment

Anthony A. Hartman

27982 Woodard Lane
Elkhart, IN 46514
thartman37@icloud.com
(574) 370-2938

EMPLOYMENT:

06/2015 to present	Safety Coordinator OZ Directional Drilling Scottsdale, Arizona Responsibilities: Oversee site safety, employee risks, evaluate employees for safety procedures and provided required and requested education as needed to maintain and update employee certifications. Maintain OSHA compliance, pre-employment screening, and Veriforce evaluations as required.
11/2014 to present	Paramedic Edwardsburg Ambulance Service Edwardsburg, Michigan Responsibilities: Stabilization and care for the sick and injured.
7/2000 to 10/2014	EMS Educator Elkhart General Hospital Elkhart, Indiana Responsibilities: Coordination, supervision, and instruction of all EMS certification programs. Coordination of the budget of the training programs. Maintenance of the Supervising/Sponsoring Hospital and Training Institution status with the State of Indiana. TC Coordinator for EGH. Maintenance and coordination of CAAHEP accreditation. Coordination of all AHA programs within EGH. Coordination and supervision of the CQI program for the Pre-Hospital providers affiliated with EGH.
9/2003 to 5/2004 (part-time)	Flight Paramedic Air Angels, South Bend, Indiana Operations Responsibilities: Assist with the primary care of the sick and injured. Provide instruction of flight safety and orientation to the flight program.

1/98 to 5/2000	Operations Manager Multi-Township EMS Warsaw, Indiana Responsibilities: Coordination, supervision, and overseeing all operations of the ambulance service. Including personnel issues and scheduling, equipment and building maintenance, and purchase of new equipment and supplies. Also, providing employee continuing education, protocol development, CQI, and computer software charting direction.
8/95 to 12/97	Training Director/ Medical Director Assistant Three Rivers Ambulance Authority Fort Wayne, Indiana Responsibilities: Coordination, supervision, and instruction of First Responder, Basic EMT, and Paramedic programs. Coordination of the budget of the training program. Maintenance of the Supervising / Sponsoring Hospital standing and Training Institution status with the State of Indiana. Investigations into concerns and questions of the responses by the field crews. Report to the Medical Director with findings of investigations and development of protocols.
7/92 to 8/95	Paramedic/ Flight Paramedic Adult Emergency Care Center / Aeromed Tampa General Hospital Tampa, Florida Responsibilities: Assist with the primary care of the sick and injured. Provided instruction of flight safety and orientation to the flight program and scheduling of the flight paramedics.
5/90 to 6/92	Training Supervisor/ Paramedic Mercy Ambulance of Reno, Inc. Reno, Nevada Responsibilities: Orientation of new employees. Organization and providing the required and optional continuing education for the staff. Research and development of new equipment or procedures. Budget for the training department. Fill in as field supervisor when needed.
8/88 to 5/90	Paramedic Mercy Ambulance of Reno, Inc. Reno, Nevada Responsibilities: Stabilization and transportation of the sick and injured.
7/84 to 8/88	Paramedic Mercy Ambulance of Fort Wayne, Inc. Fort Wayne, Indiana Responsibilities: Stabilization and transportation of the sick and injured.

EDUCATION:

High School:	Warsaw Community High School Graduation 1982
Paramedic Education:	Northeastern Indiana EMS Completed: 10/83
College:	Bachelors of Science (to be complete 1/2016) Emergency Medical Services Administration Columbia Southern University

CERTIFICATIONS:

Nationally Registered Paramedic #M0872968
Nationally Certified EMS Educator #2006090004
State of Indiana: #8214-5347

- Paramedic
- Primary Instructor

State of Michigan: #3201015436

- Paramedic

American Heart Association:

- Basic Cardiac Life Support Instructor/Affiliate Faculty
- Advanced Cardiac Life Support Instructor/Affiliate Faculty
- Advanced Cardiac Life Support for Experienced Providers Instructor
- Pediatric Advanced Life Support Instructor/Affiliate Faculty

American College of Emergency Physicians:

- International Trauma Life Support Instructor/Affiliate Faculty

American Academy of Pediatrics

- Pediatric Emergencies for Pre-hospital Professionals Course Coordinator (PEPP)

National Association of EMT's

- Advanced Medical Life Support Course Coordinator/Affiliate Faculty

Occupational Safety and Health Administration (OSHA)

- 30-hour Hazard Recognition Training for General Industry
- 30-hour Hazard Recognition Training for the Construction Industry
- 40-hour HAZWOPER
- OSHA 510: OSHA – Standards for the Construction Industry
- OSHA 500: OSHA – Trainer Course in the Construction Industry

CHASE Health & Safety

- Approved collector for required employment screenings.

Veriforce Evaluator

- Evaluator for 100+ skills and techniques through this service.

PROFESSIONAL ACTIVITIES:

National Association of EMS Educators (NAEMSE)

Board of Director Member (2010 to 2013)
Education Committee
(Appointed Chair September 2007 to September 2010)
Participated in the Model Curriculums/Instructor Resources:
Program Management
Pain Management
Emotional Wellness
Study Skills
Building a cognitive evaluation
Goals and Objectives for the EMS Education Agenda
Liaison to NREMT Board of Directors (2007 – 2011)

Member of National Faculty for NAEMSE Educator Course
Facilitated at the Chicago 2005 course
Facilitated at the Champaign, IL 2007 course

Committee on Accreditation of EMS Programs (CoAEMSP) - Site Visitor

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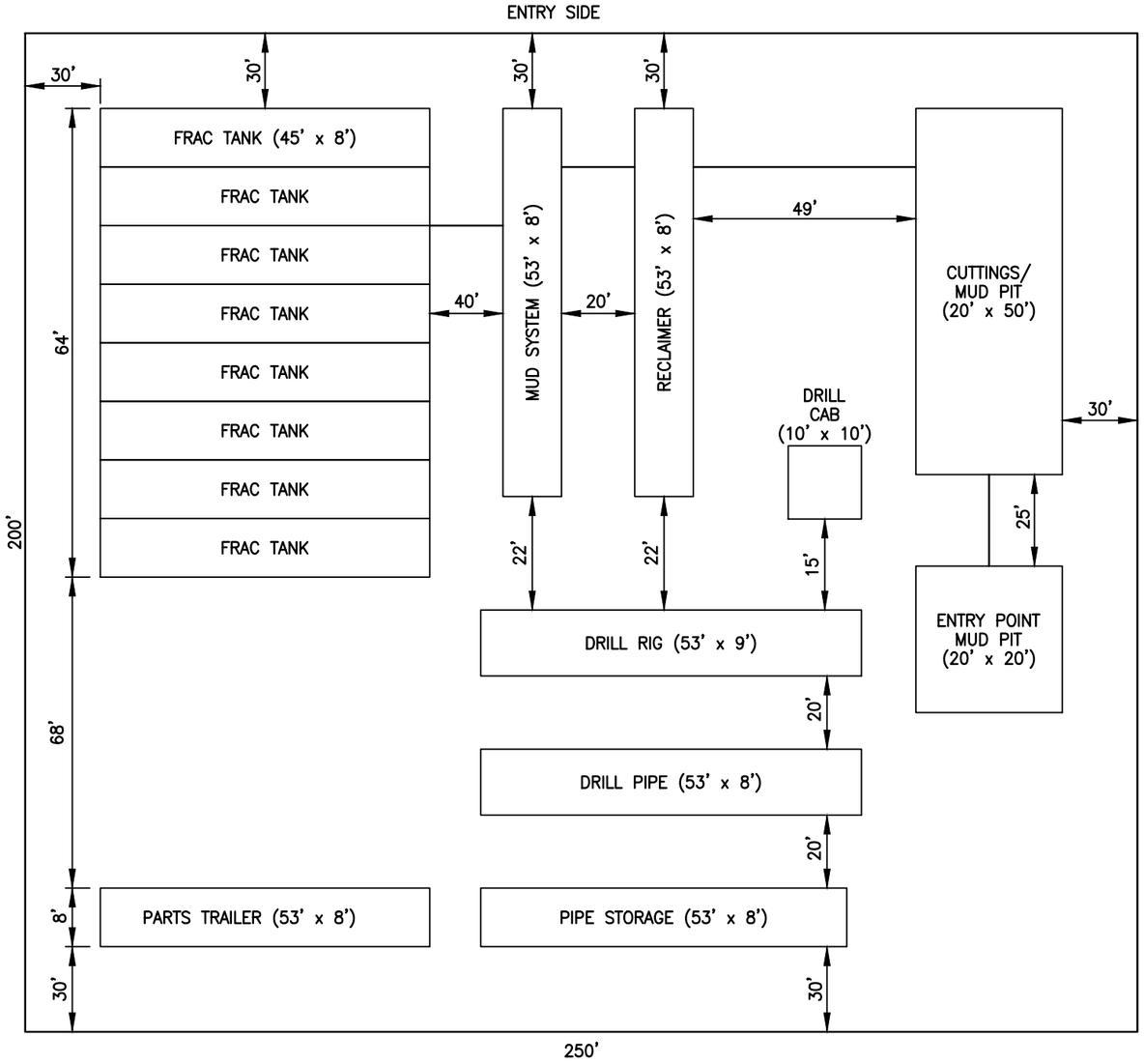
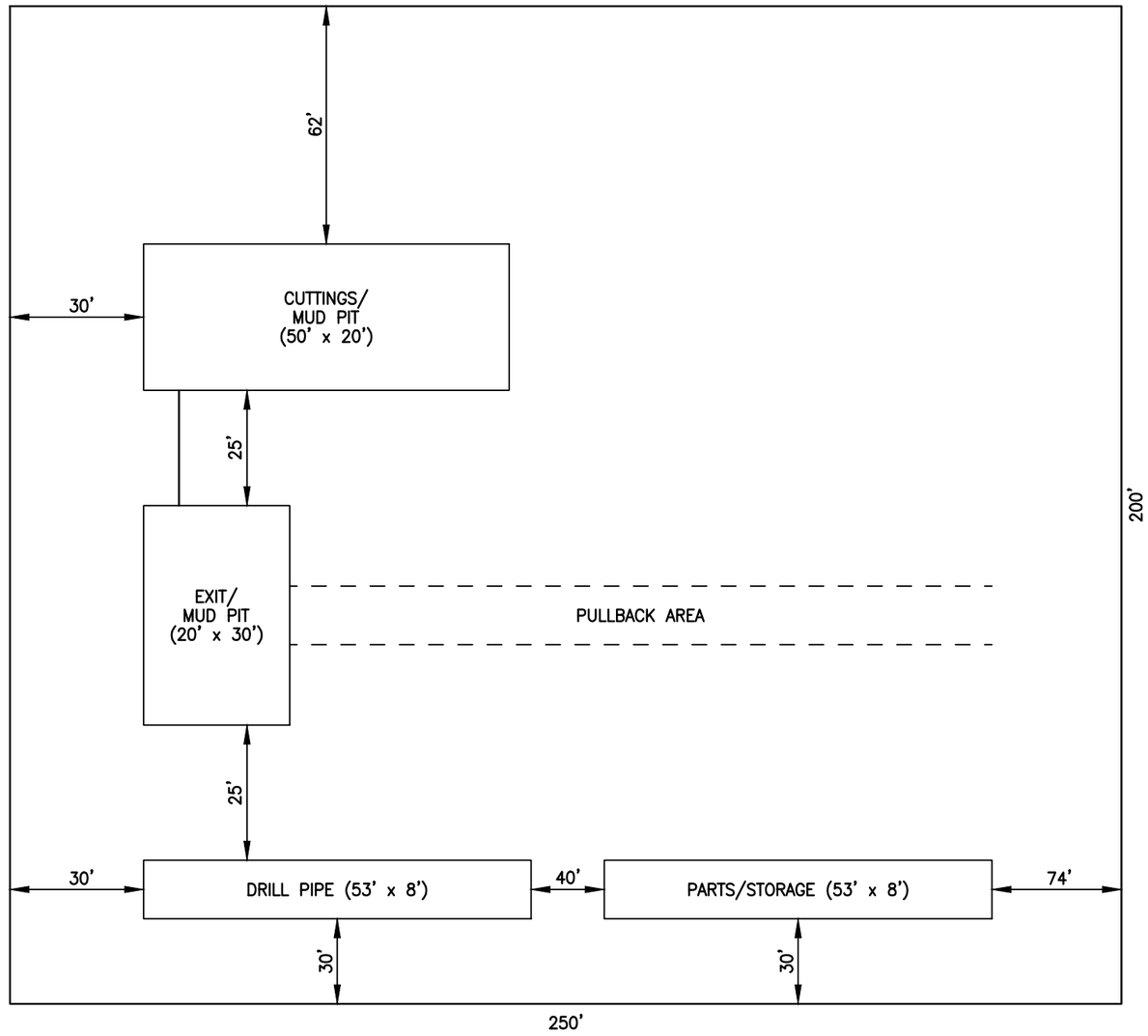
APPENDIX C
TYPICAL SITE LAYOUT





REV.	DATE	BY	DESCRIPTION	CHK.
B	9/23/15	MES	ISSUED FOR REVIEW	JCD
A	9/15/15	RER	ISSUED FOR REVIEW	JCD

PROJECT NO. 10395700

DAKOTA ACCESS, LLC

TYPICAL HDD EQUIPMENT LAYOUT

DRAWN BY: RER	DATE: 9/15/2015	DWG. NO.	REV.
CHECKED BY: JCD	DATE: 9/15/2015	ILD-P12-11	B
SCALE: N.T.S.	APP.: JCD		

FILE: R:\Projects\103957\DISCIPLINE\CAD\DRAWINGS\99-TYPICAL\ILLINOIS\10395700-ILD-P12-11.dwg PLOT DATE: 9/23/2015 BY: STEVENS, MEGHANN

APPENDIX D
DRILLING FLUIDS PROGRAM

Precision Pipeline Fluid Contingency Plan

DRILLING FLUID DESCRIPTION

The directional drilling process involves a non-hazardous drilling fluid made up of primarily water and bentonite (de-hydrated clay). Bentonite is a naturally occurring, non-toxic, inert substance that meets NSF/ANSI-60 Drinking Water Additive Standards and is frequently used for drilling potable water wells.

Products used for drilling operations will be used from the client's approved list. If any additional products not on the list are proposed, Precision will submit for approval prior to use.

DRILLING FLUID OPERATION

The drilling fluid will be mixed in a mud mixing tank relative to the mud system size to a maximum volume of 7,500 gallons and in accordance with manufacturer's recommendations. A mud composition of approximately 15 to 20 pounds of powder bentonite will be mixed with 100 gallons of water. The most effective mud composition for a given soil condition will be established, monitored and maintained throughout the drilling process. The drilling fluid will be sampled and tested daily during drilling operations. Precision's mud technician will make recommendations regarding maintenance of the mud composition.

The following table can be used as a general guideline for targeted fluid viscosities given a specific soil condition. However, actual field results typically dictate a drilling fluid target viscosity.

TABLE 1.1 – Targeted Drilling Fluid Viscosities

Sand	60 – 80 Viscosity
Silt	50 – 70 Viscosity
Clay	40 – 50 Viscosity
Rock	60 – 80 Viscosity

Once the drilling fluid is thoroughly mixed to an acceptable consistency, it is pumped from the mud tank to the drill rig. It is then pumped under pressure through the drill stem at rate between 50 to 1000 gpm to the drill head or reamer. The drill fluid, along with borehole cuttings, returns along the annular space created between the drill stem and the formation wall. Drill fluid returns to either the entry pit or exit pit, depending on the drilling activity and tool location. The mixture of materials is then pumped by a submersible pump to the mud cleaning system.

The first phase of the mud cleaning system occurs at the shakers. Heavy solids are sifted out by a shaker with screens sized for the specific soil condition. The solids are then deposited into roll-off containers where they will be stored until disposal.

The second phase of the mud cleaning system removes the medium and fine sands. The desilter/mud cleaning unit removes the remaining cuttings from the drilling fluid. These cuttings are again stored in roll-off containers while the recycled drilling fluid is pumped back and re-used in the drilling process.

DRILLING FLUID LOSS MONITORING AND MITIGATION

Best management practices are used for drilling fluid spill prevention, containment and control.

Precision Pipeline (PPL) personnel are trained in the pre-emptive measures and early response procedures specific to HDD projects. The safe handling and use of drilling fluid and materials associated with directional drilling are a primary goal of PPL drilling crews.

The Project Manager/Drilling Superintendent is responsible for implementation and execution of the site specific environmental policy, safety monitoring, and mitigation plans for every drill PPL performs.

The levels of drilling fluid monitoring and mitigation activities will vary depending on a given HDD operating condition. The following sections describe the actions to be taken under these various conditions.

Condition 1 – Normal Drilling Operations

Drilling fluid spill prevention/monitoring measures include:

1) Regular inspection of all hoses, pumps and other drilling fluid transport devices to ensure that they are clean and in good working order.
2) Site specific layout of mud handling equipment such that consideration is given to site geology, topography, storm water management, and erosion control.
3) Drilling fluid pressures will be monitored closely on-site in the drilling cabin at all times when pumping.
4) Preventative walks along the drill route to check for inadvertent releases to the surface. This is especially important during the pilot hole operation.
5) Drilling fluid returns will be continuously monitored during drilling operations.

Drilling fluid containment measures include:

1) Excavating and maintaining entry and exit side mud pits in a stable condition.
2) Regular inspection of drilling fluid levels in the mud pits during drilling operations.
3) The following equipment and materials will be onsite to allow for a timely response to any drilling fluid containment issue. A combination of items from the list will be used to construct containment around an inadvertent release, depending upon site conditions if such an event does occur.

    a. 3" Gas Trash Pumps
    b. Discharge hose: 300 ft/pump
    c. T-bar posts
    d. Post Pounder
    e. Silt fence
    f. Steel wire
    g. Shovels
    h. Pick-axe
    i. Drip Trays
    j. Portable gen-sets for power
    k. Light Stands
    l. Extension cords
    m. Sands Bags
    n. Buckets
    o. Gasoline Containers
    p. 6 mil polyethylene sheeting

q. Boat for watercourse investigation (4 person capacity – if water course is navigable)
r. Radio communication
s. Vacuum truck (may be on 24-hour call)
t. Sections of culvert (tin-horn/whistles), pipe, plastic drain tile, or other similar material to be used for containment

Condition 2 – Loss of Fluid Circulation

The primary environmental impact that a HDD crossing could have is the inadvertent return of drilling fluid to the surface. There is no alternative to the use of drilling fluid for the successful completion of the HDD crossing.

Some loss of drilling fluid occurs as it migrates into the surrounding geological formation and also fills the borehole as it increases in size during the drilling operation.

It is possible to monitor fluid losses by comparing the difference between the rates the fluid is being pumped down-hole and the rate at which it returns to the surface at the entry or exit point. The comparison between these flow rates is constantly monitored by the driller while the drilling is progressing. The driller will know immediately if an abnormal volume of drilling fluid is being lost.

The highest probability for lost circulation is during the initial pilot hole drilling. This is due to the smaller annulus between the drill stem and formation wall. As reaming progresses, this annular space increases providing a larger flow path for the drilling fluid and cuttings.

Should the driller believe that drilling fluid volumes are being lost beyond the volumes used to fill the bore-hole and to the given geologic formation; the following corrective procedures will be implemented.

1) Temporarily cease drilling operations, including pump shut down.
2) PPL will notify the permitee, who in turn will notify the personnel listed on the last page of this submittal.
3) Identify the location of the tool in relation to the point of entry or exit.
4) Dispatch experienced observers as required to monitor the area in the vicinity of the crossing, whether that is on land or in the river.
5) Restart the pump and stroke the bore-hole up and down up 2 to 6 times in an effort to size the bore-hole annulus and reestablish circulation.
6) The down-hole tool may be pulled back toward the entry or exit sides to a location of good returns and restart the pump and check circulation.
7) The drilling fluid may be thickened within the guidelines set forth by the manufacturer to aid in reestablishing circulation.
8) The drill stem may be advanced to the location of lost returns and a plugging material may be pumped into the formation to 'cake" up or set up along the path walls to aid in reestablishing circulation.

If circulation is reestablished by any of the above procedures and no significant drilling fluid release is detected;

1) Drilling operations will restart.

2) If an inspection of the HDD alignment reveals no release of drilling fluid, drilling and monitoring will return to Condition 1 – Normal Drilling Operations.

Condition 3a – Inadvertent Drilling Fluid Returns to the Surface (Terrestrial)

Should drilling fluid returns be observed at the surface the following contingency plans will be established.

In the event of a landside release:

1) PPL will immediately stop the pumping of drilling fluid and notify the permitee, who in turn will notify the personnel listed on the last page of this submittal.
2) Contain the area such that drilling fluid cannot migrate across the ground surface with hay bales, earth dams, silt fence or other best management practices. Materials and equipment for containment will be on-site on standby.
3) Pump fluid back to the mud handling location.
4) If the amount of the surface return is not great enough to allow practical collection, the affected area shall be diluted with fresh water and the fluid will be allowed to dry and dissipate. In wetlands the client and agencies will be consulted for clean-up requirements.

Drilling will resume in this manner only with consultation with the HDD inspector and Environmental Inspectors.

Condition 3b – Inadvertent Drilling Fluid Returns to the Surface (Sub-Marine)

In the event of a sub-marine release (close to shore):

1) PPL will immediately stop the pumping of drilling fluid and notify the permitee, a containment structure will be placed around the inadvertent release location, and a submersible pump will be inserted into the structure. The drilling fluid release will be pumped back to the mud handling location or to Frac-tanks for contained storage.
2) A direct suction line will be inserted into the drilling fluid release and the fluid will be pumped back to the mud handling location or to Frac-tanks for contained storage.

Drilling will resume in this manner only with consultation with the inspector and Environmental Inspectors.

In the event of a sub-marine release (off-shore):

In the event of an off-shore sub-marine release:

1) PPL will immediately stop the pumping of drilling fluid and notify the permitee, a containment structure will be placed around the inadvertent release location, and a submersible pump will be inserted into the structure. The drilling fluid release will be pumped back to the mud handling location or to Frac-tanks for contained storage.

Action Items 5-8 stated in will be performed after containment measures are in place.

Drilling will resume in this manner only with consultation with the inspector and Environmental Inspectors.

Condition 4 – HDD Failure

In the event that a pilot hole cannot be drilled, the following measures will be taken.

1) Check the equipment to verify the integrity and to determine where the problem is occurring.
2) If an obstruction is encountered:
    a. If on a land portion of the drill, excavate and remove the obstruction, if possible.
    b. If the obstruction cannot be removed, direct the drill bit around the obstruction, if possible.
    c. In the event the borehole must be abandoned, the abandoned hole will be filled with drilling fluid and an attempt will be made with a revised alignment.

MI SWACO

MATERIAL SAFETY DATA SHEET

MSDS No. 10618 **Trade Name:** MAX GEL* **Revision Date:** 01/29/2009

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Trade Name: MAX GEL*

Chemical Family: Mixture
Product Use: Drilling fluid additive.

Supplied by: M-I L.L.C.
P.O. Box 42842
Houston, TX 77242
www.miswaco.com
Telephone Number: 281-561-1512
Emergency Telephone (24 hr.): 281-561-1600
Prepared by: Product Safety Group

Revision No. 6

HMIS Rating
Health: 1* **Flammability:** 0 **Physical Hazard:** 0 **PPE:** E

4=Severe, 3=Serious, 2=Moderate, 1=Slight, 0=Minimal Hazard. *Chronic effects - See Section 11. See Section 8 for Personal Protective Equipment recommendations.

2. HAZARDS IDENTIFICATION

Emergency Overview: Caution! May cause eye, skin, and respiratory tract irritation. Long term inhalation of particulates may cause lung damage. Cancer hazard. Contains crystalline silica which may cause cancer.

Canadian Classification:
UN PIN No: Not regulated. **WHMIS Class:** D2A

Physical State: Powder. **Color:** Tan to grey **Odor:** Odorless

Potential Health Effects:
Acute Effects

Eye Contact: May cause mechanical irritation
Skin Contact: May cause mechanical irritation. Long term contact can cause skin dryness.
Inhalation: May cause mechanical irritation.
Ingestion: May cause gastric distress, nausea and vomiting if ingested.

Carcinogenicity & Chronic Effects: See Section 11 - Toxicological Information.

Routes of Exposure: Eyes. Dermal (skin) contact. Inhalation.
Target Organs/Medical Conditions Aggravated by Overexposure: Eyes. Skin. Respiratory System.

MATERIAL SAFETY DATA SHEET

Trade Name: MAX GEL®

MSDS No. 10618 Revision Date: 01/29/2009 Page 2/7

3. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient	CAS No.	Wt. %	Comments:
Bentonite	1302-78-9	80 - 95	No comments.
Silica, crystalline, quartz	14808-60-7	2 - 15	No comments.
Gypsum (Calcium sulfate) (CAS 7778-18-9 also applies.)	13397-24-5	0 - 1	No comments.
Silica, crystalline, Tridymite	15468-32-3	0 - 1	No comments.

4. FIRST AID MEASURES

Eye Contact: Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

Skin Contact: Wash skin thoroughly with soap and water. Remove contaminated clothing and launder before reuse. Get medical attention if any discomfort continues.

Inhalation: Move person to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion: Dilute with 2 - 3 glasses of water or milk, if conscious. Never give anything by mouth to an unconscious person. If signs of irritation or toxicity occur seek medical attention.

General notes: Persons seeking medical attention should carry a copy of this MSDS with them.

5. FIRE FIGHTING MEASURES

Flammable Properties

Flash Point: F (C): NA
Flammable Limits in Air - Lower (%): NA
Flammable Limits in Air - Upper (%): NA
Autoignition Temperature: F (C): NA
Flammability Class: NA
Other Flammable Properties: ND
Extinguishing Media: This material is not combustible. Use extinguishing media appropriate for surrounding fire.

Protection Of Fire-Fighters:

Special Fire-Fighting Procedures: Do not enter fire area without proper personal protective equipment, including NIOSH/MSHA approved self-contained breathing apparatus. Evacuate area and fight fire from a safe distance. Water spray may be used to keep fire-exposed containers cool. Keep water run off out of sewers and waterways.

Hazardous Combustion Products: Not determined.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions: Use personal protective equipment identified in Section 8.

Spill Procedures: Evacuate the spill area with the exception of the spill response team. Wet product may create a slipping hazard. Contain spilled material. Do not allow spilled material to enter sewers, storm drains or surface waters. Avoid the generation of dust. Sweep, vacuum, or shovel and place into closable container for disposal.

Environmental Precautions: Waste must be disposed of in accordance with federal, state and local laws.

7. HANDLING AND STORAGE

Handling: Put on appropriate personal protective equipment. Avoid contact with skin and eyes. Avoid generating or breathing dust. Product is slippery if wet. Use only in a well ventilated area. Wash thoroughly after handling.

Storage: Store in dry, well-ventilated area. Keep container closed. Store away from incompatibles. Follow safe warehousing practices regarding palletizing, banding, shrink-wrapping and/or stacking.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Limits (TLV & PEL - 8H TWA):

Ingredient	CAS No.	Wt. %	ACGIH TLV	OSHA PEL	Other	Notes
Bentonite	1302-78-9	80 - 95	NA	NA	NA	(1
Silica, crystalline, quartz	14808-60-7	2 - 15	0.025 mg/m³	see Table Z-3	NIOSH: 0.05 mg/m³ (10H day/40H wk	(R
Gypsum (Calcium sulfate) (CAS 7778-18-9 also applies.)	13397-24-5	0 - 1	10 mg/m³	15 mg/m³ (total); 5 mg/m³ (respirable	NA	None
Silica, crystalline, Tridymite	15468-32-3	0 - 1	0.05 mg/m³	see Table Z-3	NA	(R

Notes
(1) Control as an ACGIH particulate not otherwise specified (PNOS): 10 mg/m³ (Inhalable); 3 mg/m³ (Respirable) and an OSHA particulate not otherwise regulated (PNOR): 15 mg/m³ (Total); 5 mg/m³ (Respirable).
(R) Respirable fraction.
Table Z-3: PEL for Mineral Dusts containing crystalline silica are 10 mg/m³ / (%SiO2+2) for quartz and 1/2 the calculated quartz value for cristobalite and tridymite.

Engineering Controls: Use appropriate engineering controls such as, exhaust ventilation and process enclosure, to ensure air contamination and keep workers exposure below the applicable limits.

Personal Protection Equipment

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazards present and the risk of exposure to those hazards. The PPE recommendations below are based on our assessment of the chemical hazards associated with this product. The risk of exposure and need for respiratory protection will vary from workplace to workplace and should be assessed by the user.

Eye/Face Protection: Dust resistant safety goggles.

Skin Protection: Wear appropriate clothing to prevent repeated or prolonged skin contact. Chemical resistant gloves recommended for prolonged or repeated contact. Use protective gloves made of: Nitrile. Neoprene.

Respiratory Protection: All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent.

If exposed to airborne particles of this product use at least a NIOSH-approved N95 half-mask disposable or re-useable particulate respirator. In work environments containing oil mist/aerosol use at least a NIOSH-approved P95 half-mask disposable or re-useable particulate respirator.

General Hygiene Considerations: Work clothes should be washed separately at the end of each work day. Disposable clothing should be discarded, if contaminated with product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Color:	Tan to grey
Odor:	Odorless
Physical State:	Powder.
pH:	ND
Specific Gravity (H2O = 1):	2.3 - 2.6
Solubility (Water):	Insoluble
Melting/Freezing Point:	ND
Boiling Point:	ND
Vapor Pressure:	NA
Vapor Density (Air=1):	NA
Evaporation Rate:	NA
Odor Threshold(s):	ND

10. STABILITY AND REACTIVITY

Chemical Stability:	Stable
Conditions to Avoid:	ND
Materials to Avoid:	ND.
Hazardous Decomposition Products:	For thermal decomposition products, see Section 5.
Hazardous Polymerization	Will not occur

11. TOXICOLOGICAL INFORMATION

Component Toxicological Data: Any adverse component toxicological effects are listed below. If no effects are listed, no such data were found.

Ingredient	Component Toxicological Summary
Silica, crystalline, quartz	Crystalline silica is the most widely occurring of all minerals. The most common form of silica is sand. The International Agency for Research on Cancer (IARC) has designated crystalline silica in the form of quartz or cristobalite a Group 1 (carcinogenic to humans). This designation was based on an increased risk of lung cancer among crystalline silica exposed workers. IARC did note that carcinogenicity of crystalline silica in humans was not detected in all industrial circumstances studied. Further, carcinogenicity of crystalline silica may be dependent on inherent characteristics of the crystalline silica or external factors affecting its biological activity or distribution of polymorphs. (IARC Vol. 68, 1997, p. 41). The National Toxicology Program (NTP) classifies crystalline silica as "reasonably anticipated to cause cancer in humans" (6th Annual Report on Carcinogens, 1991). Long term inhalation of crystalline silica can also result in the lung disease, silicosis. Symptoms of this disease include coughing and shortness of breath. (NJ HSFS, January 1996)

Product Toxicological Information:
Long term inhalation of particulate can cause irritation, inflammation and/or permanent injury to the lungs. Illnesses such as pneumoconiosis ("dusty lung"), pulmonary fibrosis, chronic bronchitis, emphysema and bronchial asthma may develop.

12. ECOLOGICAL INFORMATION

Component Ecotoxicity Data:

Product Ecotoxicity Data: Contact M-I Environmental Affairs Department for available product ecotoxicity data.

Biodegration: ND
Bioaccumulation: ND
Octanol/Water Partition Coefficient: ND

13. DISPOSAL CONSIDERATIONS

Waste Classification: ND

Waste Management: Under U.S. Environmental Protection Agency (EPA) Resource Conservation and Recovery Act (RCRA), it is the responsibility of the user to determine at the time of disposal, whether the product meets RCRA criteria for the hazardous waste. This is because product uses, transformations, mixtures, processes, etc., may render the resulting materials hazardous. Empty containers retain residues. All labeled precautions must be observed.

Disposal Method: Recover and reclaim or recycle, if practical. Should this product become a waste, dispose of in a permitted industrial landfill. Ensure that the containers are empty by the RCRA criteria prior to disposal in a permitted industrial landfill.

14. TRANSPORT INFORMATION

U.S. DOT Shipping Description: Not regulated for transportation by DOT, TDG, IMDG, ICAO/IATA.
Canada TDG Shipping Description: Not regulated.
UN PIN No: Not regulated.

IMDG Shipping Description: Not regulated.
ICAO/IATA Shipping Description: Not regulated.

15. REGULATORY INFORMATION

U.S. Federal and State Regulations

SARA 311/312 Hazard Catagories: Delayed (chronic) health hazard.

SARA 302/304, 313; CERCLA RQ, California Proposition 65: Note: If no components are listed below, this product is not subject to the referenced SARA and CERCLA regulations and is not known to contain a Proposition 65 listed chemical at a level that is expected to pose a significant risk under anticipated use conditions.

Ingredient	SARA 302 / TPQs	SARA 313	CERCLA RQ	CA 65 Cancer	CA 65 Dev. Tox.	CA 65 Repro. F	CA 65 Repro. M
Silica, crystalline, quartz	---	---	---	X	---	---	---
Silica, crystalline, Tridymite	---	---	---	X	---	---	---

International Chemical Inventories

Australia AICS - Components are listed or exempt from listing.
Canada DSL - Components are listed or exempt from listing.
China Inventory - Components are listed or exempt from listing.
European Union EINECS/ELINCS - Components are listed or exempt from listing.
Japan METI ENCS - Components are listed or exempt from listing.
Korea TCCL ECL - Components are listed or exempt from listing.
Philippine PICCS - Components are listed or exempt from listing.
U.S. TSCA - Components are listed or exempt from listing.
U.S. TSCA - No components are subject to TSCA 12(b) export notification requirements.

Canadian Classification:

Controlled Products Regulations Statement: This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

WHMIS Class: D2A

16. OTHER INFORMATION

The following sections have been revised: 1, 6, 16

NA - Not Applicable, ND - Not Determined.

*A mark of M-I L.L.C.

MATERIAL SAFETY DATA SHEET

Trade Name: MAX GEL®

MSDS No. 10618 Revision Date: 01/29/2009 Page 7/7

Disclaimer:

MSDS furnished independent of product sale. While every effort has been made to accurately describe this product, some of the data are obtained from sources beyond our direct supervision. We can not make any assertions as to its reliability or completeness; therefore, user may rely on it only at user's risk. We have made no effort to censor or conceal deleterious aspects of this product. Since we cannot anticipate or control the conditions under which this information and product may be used, we make no guarantee that the precautions we have suggested will be adequate for all individuals and/or situations. It is the obligation of each user of this product to comply with the requirements of all applicable laws regarding use and disposal of this product. Additional information will be furnished upon request to assist the user; however, no warranty, either expressed or implied, nor liability of any nature with respect to this product or to the data herein is made or incurred hereunder.

APPENDIX E
SAMPLE FORMS

Location-
City- State-

Dates- Mpl #-

Environmental Assessment - Dakota Access Pipeline Project, Illinois -August 2016

Bore Length	0	Ream Size/Bit Size	24"	Contractor	
Total Joint Count	0	OZDD Job Number			
Serial Number		Utility	COMPANY		

Average MD	Jt No.	DATE	Steer Patterns	GPM	Viscosity	Sand Content	PSI	TORQUE PSI	TORQUE SPD	TORQUE Set	THRUST/PUL RPM	THRUST/PUL PSI	THRUST/PUL SPD	Times Start	Times Finish	Drilling Time Joint	Drilling Time Total	Jt	BREAKS Start	BREAKS End	BREAKS Time	Reason for Break
10.40	01	30-Jan-16		350	85	2	200	2,000	L		30	500	H			0:00	0:00:00	01			0:00	
#DIV/0!	02	30-Jan-16		350	85	2	200	2,100	L		30	500	H			0:00	0:00:00	02			0:00	
#DIV/0!	03	30-Jan-16		350	85	2	200	2,100	L		30	500	H			0:00	0:00:00	03			0:00	
#DIV/0!	04	30-Jan-16		350	85	2	200	2,400	L		30	500	H			0:00	0:00:00	04			0:00	
#DIV/0!	05	30-Jan-16		350	85	2	200	2,400	L		30	500	H			0:00	0:00:00	05			0:00	
#DIV/0!	06	30-Jan-16		350	85	2	200	2,400	L		30	500	H			0:00	0:00:00	06			0:00	
#DIV/0!	07	30-Jan-16		350	85	2	200	2,400	L		30	500	H			0:00	0:00:00	07			0:00	
#DIV/0!	08	1-Feb-16		350	85	2	200	2,400	L		30	500	H			0:00	0:00:00	08			0:00	
#DIV/0!	09	1-Feb-16		350	85	2	200	2,400	L		30	500	H			0:00	0:00:00	09			0:00	
#DIV/0!	10	1-Feb-16		350	85	2	200	2,400	L		30	500	H			0:00	0:00:00	10			0:00	
#DIV/0!	11	1-Feb-16		350	85	2	200	2,400	L		30	500	H			0:00	0:00:00	11			0:00	
#DIV/0!	12	1-Feb-16		350	85	2	200	2,400	L		30	500	H			0:00	0:00:00	12			0:00	
#DIV/0!	13	1-Feb-16		350	85	2	200	2,400	L		30	500	H			0:00	0:00:00	13			0:00	
#DIV/0!	14	1-Feb-16		350	85	2	200	2,400	L		30	500	H			0:00	0:00:00	14			0:00	
#DIV/0!	15	1-Feb-16		350	85	2	200	2,400	L		30	500	H			0:00	0:00:00	15			0:00	
#DIV/0!	16	1-Feb-16														0:00	0:00:00	16			0:00	

Reamer Brand-_____ Reamer Type-___26"___ Reamer Sn ##_____

APPENDIX F
BUOYANCY CONTROL PLAN

HDD BUOYANCY CONTROL PLAN

This plan outlines the general buoyancy procedures to be utilized during the pullback of the product pipe section required for HDD's on the project. The buoyancy control plan will be implemented by the foreman and his crew once the pilot hole is complete on each of the HDD's. Since each of the HDD's within the scope of the project are unique, the steps listed below may change either in order or be eliminated altogether. Steps may also be added at the Superintendent or Foreman's discretion. All procedures along with possible hazards and steps to prevent them for the day's activities will be outlined on the pre-pullback JSA during the morning tool box safety meeting on site. Safety as well as a successful pullback is of the upmost importance.

Buoyancy Control Summary

4" poly pipe will be delivered to the work area and fused together so that it can be fed inside the product pullback section utilizing a hydraulic mule specific for 30" x 0.625 WT pipe and used as a conduit to achieve the desired buoyancy amount. The water source for buoyancy control can be contained by using frac tanks or by using the Illinois River as a direct source. The addition of water into the product pullback section is closely monitored (volume, not pressure is critical during this process) and the rate at which water is pumped into the pullback section is dependent upon the formation of the soils and the pull forces required during pull back. The Superintendent or Foreman will monitor this process closely and adjust as necessary based on the existing conditions at the time of the pullback.

Step A: Fusing poly pipe

1. 4" poly pipe will be used as the conduit for buoyancy control. The poly pipe will be delivered to site in approximately 40' pieces. The pipe is SDR(standard dimension ratio) 9 with a working pressure of 200 psi and a weight of 2.71 lbs - per foot. It has a burst pressure rating of 1,600 psi and will be unloaded in an area near the end of the pullback section in an area within the prescribed work area.

2. The joints of poly pipe will then be fused together.

    A. Each joint of poly will be aligned to the next joint using a fusing machine clamp.
    B. Each end will then be trimmed to fit each other using a facing machine placed between the ends. Both ends will receive equal pressure as the operator operates a lever that will draw the two ends together and trim them simultaneously. No mechanical pressure will be used in this process.
    C. The facer will be removed and a heating plate will be cradled between the ends and equal pressure will be applied again to each end using the machine clamp. After a short period of time, the pipe will begin to create a bead where it contacts the iron.
    D. After a sufficient time with the heater, the heater will be removed and the machine clamp will again draw the two ends of the poly together to complete the weld. The two ends will be locked into the machine until they cool sufficiently to provide a good sound weld.
    E. The welded string will be lifted from the machine clamp. The weld is complete.

3. Utilizing a blue endless round sling (ENR) rated at 17,000lbs when choked, the section of welded pipe will be pulled down the ROW approximately 40 feet until the bitter end of the last fused pipe is near the fusing machine setup.

4. The process will repeat until all of the pipe is welded together in one string if possible. If work space is limited, two or more strings will be laid out until the poly pipe is ready to be loaded into the completed product pipe for pull back. The various sections will then be welded together to make one string.

5. The 4" poly pipe will not be tested; however the fusion process is completed by a certified employee.

Step B: Adding poly pipe inside pull back section.

1. The poly pipe will be pulled into the pullback section utilizing a hydraulic mule specially built for the size product pipe being used for the HDD's. The poly will have a fused eye attached to the leading edge and shackled to the mule.

2. The mule will then be started and the pipe will be pulled through the product. The mule is operated by a remote enabled with a safety override that is able to start and stop the process at any time if a problem should occur.

3. Once the mule reaches the opposing end of the pipe it will be shut down, detached from the poly and removed from the pipe.

4. If the work area does not permit fusing the pipe in one string, the process of adding the poly will be stopped and started to allow the crew to fuse additional strings to the section until it is long enough to reach from one end of the product pullback section to the other. Prior to setting up the fill pump and/or frac tanks for buoyancy, the onsite Foreman and Superintendent will review the work pace that is available and determine the best place to set up. Should there be a change of conditions, another JSA will be conducted to analyze and review any potential hazards. Several factors will determine where it will be set.

    A. Amount of available space within the ROW limits.
    B. The distance from the end of the welded section (lay down on rollers) to the end of the hole that the pipe will enter the ground. Water will begin to be added only after the first 100'+ of pipe is in the ground. This distance will vary and the distance will be discussed and agreed upon on site.

- The use and installation of an equal size vent pipe may be used in larger diameter pipe (i.e. 42"). The vent pipe shall be installed to the most leading edge of the pull head and section.

Step C: Setting up the buoyancy with frac tanks

1. Some HDD's will not have a readily available water source and will require the use of frac tanks. The general set up of the frac tanks will consist of:

    A. Frac tanks- 21,000 gal each
    B. 4 inch poly pipe
    C. 6 inch water pump- Impeller style pump (no pistons). The pump has a pressure regulator/bypass that will bypass if pressures exceed 150 psi. This set up allows pump volume not pressure to be the controlling factor, thus allowing safe control and operation of the buoyancy at all times.
    D. Kelly hose-hoses will have safety lanyards/whip lines attached at each connection. If lay flat hose is used the cam lock connections will have safety pins installed.

Step D: Setting up the buoyancy without frac tanks.

1. Some HDD's will have a readily available water source. These sites will not utilize frac tanks at all; instead, a 6" water pump will be utilized and draw directly from the water source.

2. If needed additional inline pumps will be used if the distance to pump from the water source is too long to pump the required volume for the product pullback section.

3. For this application, a water meter will also be installed on the discharge side of the pump to monitor volume being pumped into the product pullback section.

Step E: Addition of water to achieve the desired buoyancy

1. The addition of water will be closely monitored with the pulling of the product pipe. The fill rate may be quicker or slower depending on the formations of the soils and pull forces during the pull back. On the exit side of the HDD, enough water will be stored in frac tanks to completely fill the volume of the product pipe being pulled. In most cases approximately ¾ of the product pipe will be filled over the course of the pullback to control the buoyancy; however the total amount of water used will depend on the force needed to pull the product pipe.

2. The buoyancy amount can be calculated by the following:

   Multiply the square of the O.D. of the pipe, in inches, by 0.341 and subtract the pipe weight in lbs. per ft. in fresh water (0.350 for salt/sea water).

   Example -- 12” (12.75 O.D.) 33.4 lbs. per ft. (.250 W.T.)

   Buoyancy = 12.75 squared x 0.341 minus 33.4

   = 162.56 x 0.341 minus 33.4

   = 55.4 minus 33.4 = 22 lbs. per ft.

   Water volume per foot of 30” x 0.625wt pipe = 33.72 gallons per foot.

APPENDIX G
PIPE HAMMER SPECIFICATIONS

APPENDIX G

Hammer Specifications

Below are the specifications for the typical pneumatic hammers that will be provided by TT Technologies. Specifications can be provided for other hammers or pneumatic devices that may be used or are provided by other manufacture's.

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Grundoram® Directional Assist

When problems arise on a Directional Drilling job you need to act quickly to avoid a costly situation. TT Technologies offers proven solutions for tough drilling problems. The percussive power of the Grundoram pipe rammer can help free stuck pipes and drill stems, overcome hydrolock, remove product pipe and more. Keep a Grundoram on hand during your next job and ensure a trouble free bore.

CONDUCTOR BARREL™
A sure start for your bore even in the worst soil.

- Ram casings through difficult soil conditions to more desirable drill starting points.
- Guide down-hole or mud motors to rocky soils through the conductor barrel.
- Provides friction free section for product pullback.

GO! Conductor Barrel Typical Setup Animation
(Flash Plug-in required) 73k

Download Macromedia Flash Player

PULLBACK ASSIST
Overcome hydrolock with a pipe rammer.

- Rammer attached to product pipe during pullback.
- Percussive action keeps pipe moving and helps prevent high levels of pullback stress.
- Percussive power frees immobilized product pipes.

GO! Pullback Assist Typical Setup Animation
(Flash Plug-in required) 43k
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BORE SALVAGE
Remove stuck product pipe and bore again.

- Rammer attached to product pipe after pullback fails.
- Percussive action pulls product pipe, removing it from the bore.
- Salvage the job and bore again.

GO! Bore Salvage Typical Setup Animation
(Flash Plug-in required) 50k
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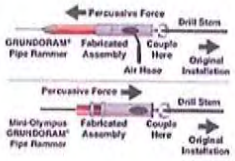

DRILL STEM RECOVERY
Retrieve Stuck Drill Stems.

- Pipe Rammer fitted with a special sleeve.
- Stuck drill stem welded to the back of the rammer sleeve.
- Percussive power frees drill stem, saving time and money.

GO! Drill Stem Recovery Typical Setup Animation
(Flash Plug-in required) 60k
Download Macromedia Flash Player

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Teaming Up Trenchless Techniques:
Pneumatic Pipe Ramming Assists Directional Drilling

by Jim Schill

Certainly not the oldest of the trenchless methods, directional drilling is arguably the best known and celebrated. The method has transcended the utility construction arena and gained the attention, to an extent, of the general population. That fact alone speaks volumes about the method's capabilities and its impact in the construction world.

One large reason for directional drilling's fame is its inherent capabilities. Massive river crossings, high profile locations and large diameter projects have created an almost modern myth. The other component is innovation. Ever innovators, drill operators and manufacturers are finding new and creative ways of tackling tough projects and difficult situations.

Recently, trenchless equipment manufacturer TT Technologies, Aurora, IL introduced several pipe ramming techniques that are helping drill operators solve drilling problems and tackle tough conditions. The techniques are being heralded throughout the industry and are changing the way drillers approach projects and respond to problems on the job.

TT Technologies product specialist Collins Orton said, "Like any other construction application, directional drilling can run into difficult situations. In certain situations using the percussive power of pipe ramming tools can help overcome problems with pullback, stuck drill stems, stuck pipe, and difficult soil conditions."

Bore Salvage & Drill Stem Recovery

Four pipe ramming techniques are being used to help prevent failed directional drilling bores and even salvage bores. Properly configured pipe rammers can be used to salvage product pipes, remove stuck drill stems and assist drills during product pullback, overcoming hydrolock.

The concept behind removing a stuck product pipe (bore salvage) and removing stuck drill stems (drill stem recovery) are simple yet highly effective. During a bore salvage the pipe rammer is attached to the end of the partially installed product pipe. The pipe rammer needs to be attached to the pipe so that it pulls the pipe from the ground. This can be accomplished through a fabricated sleeve. A winch or some type of pulling device is used to assist the rammer during operation. In many cases, the percussive power of the pipe rammer is enough to free the stuck pipe and allow it to be removed from the ground.

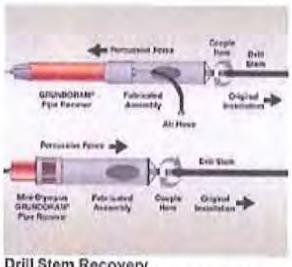
Bore Salvage

Specially configured, the Grundoram can help remove a product pipe if a bore fails. This

allows the contractor to correct the original problem and attempt the bore again.

During a drill stem recovery the principal is the same, however, there are two possible tool configurations. Depending on the situation, contractors may opt to remove the drill stem from the ground or, if the stem is still attached to the drill rig, they may choose to push on the stem while the drill rig pulls back.

Orton said, "In these situations typically the contractor has run out of options and is looking to salvage the project. As most know, drill stems can be very expensive, so leaving them stuck in the ground is not desired. Product pipe, obviously, is very expensive as well. The last thing anyone wants to do is leave it in the ground as an incomplete bore. Plus, by removing it, the contractor now has the opportunity correct the original problem and bore again."



Drill Stem Recovery
The percussive force of the Grundoram can free stuck drill stems by either removing them from the ground or pushing on them while the drill rig pulls.

Pull Back Assist
The pullback assist method works directly on getting the product pipe installed. Drilling underwater or in loose flowing soil conditions a condition known as hydrolock can occur. Orton said, "Hydrolock is a situation were the external pressure being put on the product pipe from ground water pressure, drilling fluid pressure and/or soil conditions exceeds the drill rig's pullback capability or the product pipe's tensile strength. The percussive action of a pipe rammer in this situation can help free the immobilized pipe."

The pullback assist technique has been successfully used on steel pipe, as well as HDPE. The technique can be used as a safety measure in anticipation of hydrolock problems or after the pipe has become immobilized (See Diagram C). According to Orton, time is a key factor with any of these methods. He said, "Reaction time is always important. Not hesitating to mobilize needed equipment and expertise in these situations can really make the difference between success and failure. Success rates improve dramatically depending upon how quickly problems are responded to. In fact, a number of drilling contractors are starting bring ramming equipment to directional drilling sites as a form of insurance in case problems develop."

Pullback Assist
During pullback assist the percussive action of the Grundoram keeps product pipes moving during pullback, helping overcome hydrolock and preventing high levels of pullback stress.

Conductor Barrel™
The Conductor Barrel process differs slightly from the other three methods in the sense that it deals with the actual drilling aspect of the project rather than pullback or recovery. The concept behind the Conductor Barrel is creating a clear pathway through poor soil conditions so that drilling can begin in more preferable soil conditions. The success of a drilling operation can often be determined right at the start. If drilling does not begin in soil that is conducive to drilling, the success of the entire project can be put in jeopardy. Loose, unsupported soils are prime candidates for the Conductor Barrel method.

During the Conductor Barrel process, casings are rammed into the ground, at a predetermined angle, until desirable soil conditions are met. The spoil is removed from the casing with an auger or core barrel. Drilling proceeds within the casing in the desirable soil conditions. In addition to assisting drilling operations at the start, the conductor can also serve as a friction-free section during pullback (See Diagram D).

Orton said, "The conductor barrel technique is often used for river or water crossings. The length of the conductor barrel is determined by soil conditions, the angle of the bore and the depth of the crossing below the waterway. Regardless, it is imperative for drilling to begin in suitable soil conditions. In addition, the conductor barrel can prevent situations in unstable soils where drilling fluids under pressure force their way into waterways or wetlands, acting in a similar fashion to containment cells."

Drilling contractors throughout North America have successfully employed all four directional assist techniques.

Conductor Barrel™
Conductor Barrel casings create a clear path through difficult soil conditions allowing drill operations to begin in more desirable soil conditions. Once the casing is rammed to the desired depth the spoil is cleaned out and drill takes place within the casing.

Cherrington Corporation Tackles Tough River Crossing with Conductor Barrel Technology

by Jim Schill

With over 30 years of experience in directional drilling and ties to the method's origins, Cherrington Corporation, Sacramento, CA is regarded as one of the most knowledgeable and experienced horizontal directional drilling (HDD) contractors in the world. A recent project in Vancouver, WA highlights the contractor's ability and resourcefulness.


The Vancouver, WA project called for the installation of a 12-inch steel conduit, 5,500 feet, under the Columbia River. Poor soil conditions at the start prompted Cherrington Corporation to utilize a pneumatic pipe rammer to install a Conductor Barrel.

The project in Vancouver called for the installation of a 12-inch steel conduit, approximately 5,500 feet under the Columbia River to a point just west of Portland, OR. Once installed, the conduit would house 14 smaller, PE fiber-optic cable conduits.

Once on site, Cherrington Operations Manager, Mark Parsons knew drilling would be difficult. According to Parsons, the soil conditions at the start of the project were not conducive to drilling operations. He said, "The soils that we encountered in the beginning were unconsolidated cobbles and boulders and basically not drillable. Because of the unconsolidated nature of the formation, maintaining the bore-hole trajectory was not possible due to a lack of bore-hole integrity. We tried several different methods to successfully penetrate and steer through the formation. In this industry, we are all eternal optimists. We like to think that the next foot is going to be better drilling." The soil conditions did not improve and Parsons was forced to re-evaluate the situation.

After discussions with the client, it was decided that the only way to get through this formation was to use the Conductor Barrel™ technique. TT Technologies Product Specialist Collins Orton was contacted to arrange delivery of a pneumatic pipe rammer for a Conductor Barrel installation. Orton delivered an 18-inch diameter Grundoram Goliath and equipment for ramming a 24-inch and 30-inch

diameter conductors. Crews began ramming a 30-inch diameter lead casing at a 16.5-degree angle. Parsons explained that the angel of the bore had to be altered from the original drilling angle in order for the conductor barrel to reach the drillable formation quickly. More sections of the 30-inch casing were added and ramming continued until the conductor barrel reached 156-ft mark.

At this point, they met resistance and the decision was made to ram a smaller casing inside of the 30-inch casing. Crews removed the spoil from the 30-inch casing with an auger and a core barrel. Once spoil was removed, the crew set up for ramming 40-foot long, 24-inch diameter casings inside of the original casing. Over the course of the next several days, crews welded and rammed the 24-inch diameter casing sections to a depth of 325 feet. At 325 feet, the Cherrington crew removed more spoils from the casings and then installed a 10 3/4-inch wash-over casing for centralization of the drill pipe. The conductor barrel actually created an unobstructed raceway through the unconsolidated cobbles and boulders and to the drillable formation.

After reaching the drillable formation, the Cherrington crew was able to complete a 5,500-foot pilot bore-hole under the river. After removing the 10 3/4-inch wash-over pipe, the crew forward reamed and ultimately pulled back the 12-inch steel conduit successfully. Parsons said, "We've been forced to use the Conductor Barrel technique in the past where nothing else would work and I'm sure we'll use it again in the future if circumstances warrant. It's a viable option when confronted with impossible drilling conditions."

Trenchless Technology, August 2002

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With A Little Help From My Friends: Sunland Construction Completes Large Diameter Pullback with HDD Ram Assist

Print this Job Story PDF Format

by Jim Schill

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Pipe ramming continues to demonstrate its versatility, especially when it is used in concert with a directional drilling application. James Daigle, Division Manager with Sunland Construction, Inc. Eunice, LA, knows the value that pipe ramming adds when working on difficult, large diameter HDD projects. Recently, Daigle and his crews were able to complete a difficult large diameter HDD river crossing with the help of pipe ramming HDD assist techniques in Charleston, SC.

Daigle said, "Charleston Water System saw the need for additional water supply because of population growth and increasing demand. We were involved in two of the HDD portions of the project, one under Coulter Creek and the other under the Cooper River. We were subcontracted for the project by the prime contractor Skibeck Pipeline Company, Inc., Randolph, New York."

Sunland Construction crews used a barge to transport the Grundoram Taurus pneumatic pipe rammer to the job site for the HDD Assist operation. The crew was attempting a 5,400-ft pullback of 40-in casing when pullback stalled 700 feet short.

The Clouter Creek and Cooper River bores both called for the installation of a 40-inch diameter steel water main 0.700-inch wall thickness. The Clouter Creek bore measured 2,739 feet, while the Cooper River bore was almost twice the distance at 5,481 feet. Both bores were part of a larger water main installation project for the Charleston Water System (CWS), Charleston, SC.

Anticipating the potential for challenging conditions, Daigle contacted pipe ramming specialist Brian Hunter, TT Technologies, Aurora, Ill and scheduled the delivery of a pneumatic pipe ramming tool. Hunter said, "We have worked on several highly challenging directional drilling projects with

James (Daigle) and the Sunland Construction crews. Having a pipe ramming tool on site during a difficult pullback can really improve chances for success when things don't go as planned. In this particular situation James was prepared and called ahead to have the rammer ready in case it was needed."

Several pipe ramming techniques have been developed over the last several years to successfully remove stuck drill stems, assist directional drill rigs during difficult pullbacks, free immobilized product pipes and even salvage failed bores by removing stuck pipe from the

For the project Daigle had a 24-inch diameter Grundoram Taurus pneumatic pipe rammer delivered from TT Technologies.

Municipality & Contractor Background

According to the its Web site, the Charleston Water System has been providing potable water to the residents of the Charleston area since 1917. Before the water utility was formed, residents got their water through wells and cisterns. But poor sanitation and contamination forced city leaders to organize and find

safer, more reliable sources of water.

Today the Charleston Water System provides potable to over 101,000 residential accounts, servicing over 350,000 people. That service also includes wholesale service to the US Department of Defense and several surrounding communities. In early 2006, the CWS Board approved a $155.5 million capital

improvement program to meet rising demands on its water and wastewater infrastructure. A portion of that program includes the 40-inch diameter water main that Daigle and Sunland Construction were subcontracted to install.

Sunland Construction was incorporated in 1974 in Louisiana. Since then, the company has become one of the largest pipeline contractors in the United States with an average workforce of 600 people and a peak workforce topping 1,600 employees. The directional drilling division of Sunland was created in 1991 and is now considered a premier directional drilling provider. The CWS project would put their skills to the test.

Pullback

Directional drilling operations under water face distinct challenges. Difficult soil conditions under river bottoms, lakes and even an ocean combined with the weight of the pipe and the hydrostatic pressure of the water itself can create problems during drilling applications. Directional changes within the bore itself can compound those problems. Reaching a point during

product pullback where the pulling forces required to pull in the pipe exceed maximum capability (a condition often referred to as hydrolock) is one potential problem.

Daigle said, "The Clouter Creek bore was ultimately completed without issues. But we had two problems on the Cooper River bore. The first was the soil conditions. We had marl in that area. Marl is a really heavy clay type soil, a very dense material and we drilled through several thousand feet of that. We also had to contend with several deviations in elevation and alignment during the bore that added to the difficulty level." For the project, Sunland used a self-manufactured 700,000 lb capacity drill rig.

Daigle continued, "We set up on shore, on Virginia Avenue and drilled out, under an existing refinery, beyond the refinery, under the river, and then exited out on the Corp of Engineers landfill. It's basically an area that is used to accumulate the spoils, silts, and soil that is taken out of the river when it's dredged. The river is dredged periodically for shipping traffic in order to maintain the proper water depth.

The product pipe was actually built by Skibeck on the spoil pile area. After the pilot bore was complete, we began the backreaming process. We made five reamer passes. We reamed a 20-inch, a 32-inch, a 36-inch, a 42-inch and finally a 54-inch. At that point, we attached the 5,500 feet of 40-inch steel and

ground.

During the pullback assist the Grundoram pipe rammer is placed at the end of the pipe string. The dynamic energy of the rammer is transferred down the pipe string to the lead end of the pipe. In many cases the percussive force is enough to free the stuck pipe.

Within ten minute of utilizing the pipe rammer, the immobilized pipe began moving and pullback was successfully completed. Sunland preordered the pipe rammer as an "insurance policy" for this difficult bore.

The Sunland Construction crews used a self-manufactured 700,000 lb capacity drill rig for the difficult water main installation project under the Cooper River in South Carolina.

began pullback."

The pullback began at seven o'clock in the morning on a Tuesday. By midnight, the pipe became lodged and pullback stopped 700 feet short of a successful bore. The crew shut down operations for the night. However, because Daigle had pre-ordered the Grundoram Taurus, it was scheduled to be on site the next morning at eight o'clock. An HDD Assist operation was planned.

HDD Rescue

According to TT Technologies National Sales Manager Brian Mattson, several pipe ramming techniques have been developed by TT Technologies and its partner contractors over the last few years to assist directional drill rigs in difficult situations. The techniques have been used to successfully remove stuck drill stems, assist directional drill rigs during difficult pullbacks, free immobilized product pipes and even salvage failed bores by removing stuck pipe from the ground.

Mattson said, "By utilizing the percussive action of the Grundoram pipe rammer we can really help drilling operations. These techniques can help avert costly situations where product pipes or drill stems get stuck. We're actually seeing drilling contractors bring pneumatic pipe rammers to job sites as a kind of insurance policy. It's been very positive for the industry."

After the pipe ramming tool arrived on site, it was loaded on a barge with two 1600 cfm air compressors and towed to the spoil pile area. According to Hunter the HDD pullback assist procedure is fairly simple to understand. He said, "The whole idea behind a pullback assist is to utilize the percussive action of the rammer to free the stuck pipe. The rammer is attached to the back of the pipe string. The dynamic energy of the rammer is transferred down the pipe string to the lead end of the pipe. In many cases the dynamic energy generated by the rammer is enough to free the stuck pipe and get it moving again. Sometimes it takes just a matter of minutes."

The 24-inch diameter rammer was connected to the end of the 40-inch diameter pipe string through a series of segmented ram cones. Once the connection was complete the rammer was started and the HDD assist was underway. Daigle said, "It was probably about 10 minutes after tapping on the pipe with the rammer that it became dislodged and we were able to pullback the remaining 700 feet without trouble."

Feedback

According to Hunter, everyone associated with the project was pleased with the results. He said, "The timing of everything really worked out. The Sunland Construction crews are excellent to work with. And ultimately they got their project completed on time. Having the rammer ready to go certainly helped out."

Daigle said, "Having the rammer available for an HDD assist on risky projects is basically an insurance policy. At least that's the way I view it. That's why I pre-ordered it for this one. I didn't mind spending the extra dollars to have it on site. Having it on site meant that we avoided having to wait through several days of shipping and set up. I was actually able to accomplish what I needed to accomplish on time, rather than having the entire job shut down for three days waiting for the tool to arrive. It was well worth it."

Jim Schill
Technical Writer
Mankato, MN

Trenchless Technology, *November 2006*

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The Grundoram® Advantage

Whatever direction your work takes you, Grundoram can handle it . . . from conventional horizontal pipe ramming to vertical pile driving. The Grundoram pneumatic ramming tool is used for the trenchless installation of steel pipe through a wide variety of soil types, without any rise or fall in the ground's surface. Some casing installation methods are impaired or even rendered inoperable by rock or boulder filled soils. During the pipe ramming process however, boulders and rocks as large as the casing itself are "swallowed up" as the casing moves through.

If you can't see the video above, click this button to download the latest Flash Player.

Grundoram: What it Does

Pipe ramming for horizontal, vertical, and angled installation of steel pipes or casings. Additionally the Grundoram can be used to assist or salvage directional drilling operations.

How it Works

The pneumatic Grundoram attached to the back of steel pipes or casings and hammers them into the ground. Pipe can be driven as one continuous run or in sections depending on the space available at the insertion site. Spoil is removed by using compressed air and/or water, augers, or skid steers on larger diameter casings.

Cost Savings

- ✓ Grundoram is completely self-contained for fast, efficient, and safer installations of steel casings.

Features

- ✓ Grundoram models are available for a variety of applications and are proven effective in the toughest conditions.

- ✔ Faster installation of large pipe without ground slumping
- ✔ Works equally well in confined & ample work areas
- ✔ Swallows rock up to the diameter of the new casement
- ✔ Minimal disruption to traffic, buildings, and other utilities
- ✔ Avoids sizable surface damage and costly restoration required for old trenching methods
- ✔ Accelerated project completion timeline
- ✔ Easy to set up and operate
- ✔ Each tool is adaptable to several casing diameters
- ✔ Unlike other pneumatic tools, each Grundocrack tool head and casing are made from a solid block of alloy steel for optimum strength and durability
- ✔ Minimal maintenance
- ✔ Long service life
- ✔ Anti-corrosive construction

Models

Fifteen versatile models are available that accommodate most project needs. Grundoram can install casings from 4 inches to 122 inches in diameter, with diameters up to 147 inches and larger possible.

Next Step

- ✔ Contact TT Technologies to see if Grundoram is the right solution for your needs
- ✔ Read job stories that feature the Grundoram in action

APPENDIX H
DRILL PIPE INSPECTION/CERTIFICATION REPORTS

JT Miller Inspection Completion Report

5 1/2" Drill Pipe

Job# 15-444

Date: 8-Jun-15 John Lawrie Inc PO #: 9947 State Energy Insp. #: 12759 504759

Quantity: 169 Jnts DWB 72 Jnts UFFS 0 Jnts

Inspection Results

Grade	Weight	Premium	Pin Repair	Box Repair	Both Repair	Total	$/Jnt	$ Total
E75	21.90#					0		
E75	24.70#					0		
X95	21.90#					0		
X95	24.70#					0		
G105	21.90#					0		
G105	24.70#					0		
S135	21.90					0		$0.00
S135	24.70#	1	1	1	69	72	$70.00	$5,040.00
Class 2	21.90#					0		$0.00
Class 2	24.70#					0		
UFFS	21.90#					0		
UFFS	24.70#					0		$0.00
Inspection Totals		1	1	1	138	72		$5,040.00
Separate Prior to Inspection						97	$25.00	$2,425.00
Blacklight						72	$30.00	$2,160.00
Total Inspection Cost						**Per Ft:**	[redacted]	[redacted]

Additional Services for Premium Pipe

	Quantity	Units	Price	$ Total
Straightening		Jnts	[redacted]	
Recut/Phospate	140	Ends		
Make and Break		Sets		
Thread Rep		Hours		
Other				
Additional Services Total				[redacted]

Total Cost (Inspection & Services) [redacted]

FIELD INSPECTION REPORT

State Energy Inspection Service, Inc.
Mailing: P.O. Box 1008, Crosby, TX 77532
Office: 281-962-2010 **Fax:** 281-962-2071

WORK ORDER NO. 12759
P.O. #: 9947
DATE: 5/21/2015

Customer
JT Miller
15555 Miller Road 1
Houston, TX 77049

Location
John Lawrie, Inc.
15555 Miller Road 1
Houston, TX 77049

SERVICE: **USED DRILL PIPE:** Damaged Ends

PIPE DESCRIPTION: 5 1/2" **O.D.** S-135 **Grade** 24.70# **# / Lbs./ft.**

II **Range** .415" **Wall** 5 1/2" FH **Connections** N/A **Drift Dia. X** N/A **Long**

SUMMARY OF RESULTS

70 - Damaged Pins

70 - Damaged Boxes

0 - Refaced/Rebevled Pins

0 - Refaced/Rebeveled Boxes

0 - Damaged Pin Hard Bands

0 - Damaged Box Hard Bands

0 - Bent

SERVICE BY: Jose Aguilar

SEIS Form 409 Rev. 1

STATE ENERGY INSPECTION SERVICES, INC.
P.O. Box 1008
Crosby, TX 77532
Office: 281-962-2010
Fax: 281-962-2071

CUSTOMER NAME JT Miller
ADDRESS 15555 Miller Road 1, Houston, TX 77049
LOCATION 15555 Miller Road 1, Houston, TX 77049
CUSTOMER ORDER# 9947
WORK ORDER NO. 12759
Date: 5/21/2015

INSPECTION REPORT OF USED DRILL PIPE

72 LENGTHS 5 1/2" O.D. GRADE S-135 WEIGHT 24.70# LB/FT

.415" WALL CONN 5 1/2" FH RANGE II COATED PIPE NO

TYPE OF INSPECTION: **USED DRILL PIPE INSPECTION:** Electro-log Standard Rack Inspection, O.D. Gauging Full Length, Four Ultrasonic Readings Mid Tube and/or At Point of Wear, Ultrasonic Shear-Wave Upsets, Caliper Tool Joints; TH-Hill Dimensional II and Clean and Visual Connections

CLASSIFICATION

NOTE: THIS PIPE WAS INSPECTED TO: DS-1 CAT 5 Inspection

SUMMARY OF RESULTS

72 LENGTHS PREMIUM CLASS PIPE IDENTIFIED BY ONE PUNCH MARK ON PIN TAPER AND TWO WHITE PAINT BANDS

0 LENGTHS PREMIUM CLASS PIPE IDENTIFIED BY ONE PUNCH MARK ON PIN TAPER AND TWO WHITE PAINT BANDS NEED TOOL JOINT REPAIR PRIOR TO USE FOR NORMAL DRILLING SERVICE

TOOL JOINT CONNECTION								
SHOULDER DAMAGE		THREAD DAMAGE		BELOW MIN REQ		CRACKED		SWELLED
PIN	BOX	PIN	BOX	PIN	BOX	PIN	BOX	BOX

0 LENGTHS CLASS 2 PIPE IDENTIFIED BY TWO PUNCH MARKS ON PIN TAPER AND ONE YELLOW PAINT BAND

REASON FOR DOWN GRADING				
WEAR	MASH	PITTING	SLIP AREA	UNDERSIZED

TOOL JOINT CONNECTION								
SHOULDER DAMAGE		THREAD DAMAGE		BELOW MIN REQ		CRACKED		SWELLED
PIN	BOX	PIN	BOX	PIN	BOX	PIN	BOX	BOX

0 LENGTHS CLASS 3 PIPE IDENTIFIED BY THREE PUNCH MARKS ON PIN TAPER AND ONE ORANGE PAINT BAND

REASON FOR DOWN GRADING				
WEAR	MASH	PITTING	SLIP AREA	UNDERSIZED

TOOL JOINT CONNECTION								
SHOULDER DAMAGE		THREAD DAMAGE		BELOW MIN REQ		CRACKED		SWELLED
PIN	BOX	PIN	BOX	PIN	BOX	PIN	BOX	BOX

0 LENGTHS CLASS 4 PIPE IDENTIFIED BY FOUR PUNCH MARKS ON PIN TAPER AND ONE RED PAINT BAND

CRACK	OD CRACK	WASHOUT

72 Total lengths Inspected

Comments: Identified By Two Green Paint Bands in Slip Area.

Inspector: Jose Aguilar

REFACE	
PIN	BOX
0	0
BEVEL DIAMETER	
PIN	BOX
0	0

SEIS Form 506 Rev. 1

STATE ENERGY INSPECTION SERVICES, INC.
Drill Pipe Worksheet

Customer: JT Miller **W.O. #:** 12759 **P.O. #:** 9947 **Date:** 5/21/2015

Pipe O.D. 5 1/2" **Grade** S-135 **Wt/Lbs/ft.** 24.70# **Wall Thickness** .415" **Connections** 5 1/2" FH

COMPLETE DRILLPIPE					PIPE BODY									TOOL JOINT																				
														BOX									PIN												
JT. #	ELECTRO-LOG CLASSIFICATION P	2	3	4	LOW WALL	ULTRASONIC WALL READINGS 1	2	3	4	O.D. Wear	Mash	Slip Area Dam.	Plastic Coating	O.D.	TONG SPACE	CONT. BORE DIA.	SHOUD WIDTH	CONT. BORE LGTH	SEAL WIDTH	BEVEL DIA.	HARD BAND	COND	O.D.	TONG SPACE	I.D.	SEAL WIDTH	BEVEL DIA.	NECK LGTH	HARD BAND	COND	Grade	Bent	Remarks
1	X				.434	.434	.439	.442	.440				1	7 3/18	7 9/16	OK	OK	OK	OK	OK	OK	OK	7 1/4	6 9/16	3	OK	OK	OK	FLUSH	OK	S3		
2	X				.420	.423	.436	.427	.420				1	7 5/16	7 9/16	OK	OK	OK	OK	OK	OK	OK	7 5/16	5 3/4	3	OK	OK	OK	OK	OK	S3		
3	X				.427	.427	.442	.430	.429				1	7 3/8	7 7/8	OK	OK	OK	OK	OK	FLUSH	OK	7 5/16	5 5/16	3	OK	OK	OK	FLUSH	OK	S3		
4	X				.408	.436	.447	.433	.408				1	7 5/16	9	OK	OK	OK	OK	OK	FLUSH	OK	7 5/16	6 11/16	3	OK	OK	OK	FLUSH	OK	S3		
5	X				.419	.441	.436	.429	.419				1	7 1/4	8 3/4	OK	OK	OK	OK	OK	OK	OK	7 1/4	6 7/8	3	OK	OK	OK	K	OK	S3		
7	X				.415	.440	.420	.415	.448				1	7 5/16	8 3/4	OK	OK	OK	OK	OK	FLUSH	OK	7 3/8	6 5/8	3	OK	OK	OK	FLUSH	OK	S3		
8	X				.414	.430	.414	.417	.441				1	7 5/16	7 5/8	OK	OK	OK	OK	OK	OK	OK	7 5/16	6 13/16	3	OK	OK	OK	OK	OK	S3		
9	X				.429	.442	.447	.429	.433				1	7 5/16	8 7/8	OK	OK	OK	OK	OK	FLUSH	OK	7 5/16	6 3/4	3	OK	OK	OK	FLUSH	OK	S3		
10	X				.426	.426	.446	.434	.445				1	7 5/16	8 1/8	OK	OK	OK	OK	OK	FLUSH	OK	7 5/16	6 7/8	3	OK	OK	OK	FLUSH	OK	S3		
11	X				.411	.440	.431	.411	.418				1	7 1/8	8 15/16	OK	OK	OK	OK	OK	OK	OK	7 1/8	7 1/4	3	OK	OK	OK	OK	OK	S3		
12	X				.426	.435	.430	.426	.449				1	7 5/16	8 3/4	OK	OK	OK	OK	OK	FLUSH	OK	7 5/16	6 3/16	3	OK	OK	OK	FLUSH	OK	S3		
13	X				.416	.432	.416	.437	.454				1	7 1/4	9 1/8	OK	OK	OK	OK	OK	FLUSH	OK	7 5/16	7 5/16	3	OK	OK	OK	FLUSH	OK	S3		
15	X				.421	.424	.421	.452	.446				1	7 5/16	7 5/16	OK	OK	OK	OK	OK	OK	OK	7 5/16	6 3/16	3	OK	OK	OK	OK	OK	S3		
16	X				.416	.416	.431	.444	.457				1	7 3/8	8	OK	OK	OK	OK	OK	FLUSH	OK	7 5/16	6 3/8	3	OK	OK	OK	FLUSH	OK	S3		
17	X				.430	.436	.444	.430	.458				1	7 3/8	8 7/8	OK	OK	OK	OK	OK	FLUSH	OK	7 3/8	6 7/8	3	OK	OK	OK	FLUSH	OK	S3		
18	X				.418	.432	.418	.423	.429				1	7 5/16	8 1/2	OK	OK	OK	OK	OK	FLUSH	OK	7 5/16	6 5/8	3	OK	OK	OK	FLUSH	OK	S3		
19	X				.421	.421	.433	.459	.427				1	7 5/16	8 3/8	OK	OK	OK	OK	OK	FLUSH	OK	7 3/8	6 3/8	3	OK	OK	OK	FLUSH	OK	S3		
20	X				.413	.444	.413	.422	.436				1	7 5/16	8 1/16	OK	OK	OK	OK	OK	FLUSH	OK	7 5/16	6 1/8	3	OK	OK	OK	FLUSH	OK	S3		
21	X				.419	.426	.419	.430	.469				1	7 1/4	8 5/8	OK	OK	OK	OK	OK	OK	OK	7 1/4	6 13/16	3	OK	OK	OK	OK	OK	S3		
27	X				.430	.436	.430	.461	.458				1	7 5/16	9 1/8	OK	OK	OK	OK	OK	FLUSH	OK	7 3/8	6 7/8	3	OK	OK	OK	FLUSH	OK	S3		
29	X				.427	.442	.435	.427	.441				1	7 5/16	8 3/8	OK	OK	OK	OK	OK	FLUSH	OK	7 3/8	6 13/16	3	OK	OK	OK	FLUSH	OK	S3		
30	X				.403	.447	.431	.403	.418				1	7 5/16	9 1/8	OK	OK	OK	OK	OK	FLUSH	OK	7 5/16	6 9/16	3	OK	OK	OK	FLUSH	OK	S3		
32	X				.420	.426	.431	.424	.420				2	7 1/4	8 15/16	OK	OK	OK	OK	OK	FLUSH	OK	7 1/4	6 5/8	3	OK	OK	OK	FLUSH	OK	S3		
33	X				.414	.420	.422	.433	.414				0	7 1/16	10 1/2	OK	OK	OK	OK	OK	OK	OK	6 7/8	10 13/16	3 3/8	OK	OK	OK	NONE	OK	S3		
34	X				.417	.424	.431	.417	.436				1	7 1/16	8 5/8	OK	OK	OK	OK	OK	FLUSH	OK	7 1/8	9 3/16	3	OK	OK	OK	NONE	OK	S3		
39	X				.420	.429	.420	.423	.427				1	7 1/8	9 3/16	OK	OK	OK	OK	OK	FLUSH	OK	6 15/16	9 1/8	3	OK	OK	OK	NONE	OK	S3		
40	X				.399	.422	.399	.417	.407				0	7 1/8	9 9/16	OK	OK	OK	OK	OK	OK	OK	7	8	3 3/8	OK	OK	OK	NONE	OK	S3		
41	X				.415	.429	.418	.415	.425				0	7 3/16	8 7/8	OK	OK	OK	OK	OK	FLUSH	OK	7 3/16	7 3/4	3	OK	OK	OK	FLUSH	OK	S3		
42	X				.397	.400	.397	.408	.418				2	7 1/16	10 3/8	OK	OK	OK	OK	OK	OK	OK	7 1/16	11 1/4	3 3/8	OK	OK	OK	NONE	OK	S3		
43	X				.426	.437	.442	.439	.426				2	7 1/4	8 1/8	OK	OK	OK	OK	OK	FLUSH	OK	7 1/4	6 3/8	3	OK	OK	OK	FLUSH	OK	S3		
44	X				.387	.387	.395	.392	.418				0	7 1/16	10 5/8	OK	OK	OK	OK	OK	OK	OK	7	11	3 3/8	OK	OK	OK	NONE	OK	S3		
45	X				.417	.427	.417	.438	.433				2	7 5/16	7 1/2	OK	OK	OK	OK	OK	FLUSH	OK	7 5/16	6 5/8	3	OK	OK	OK	FLUSH	OK	S3		
46	X				.414	.421	.426	.414	.440				1	7 5/16	9	OK	OK	OK	OK	OK	FLUSH	OK	7 5/16	6 5/8	3	OK	OK	OK	FLUSH	OK	S3		
47	X				.403	.413	.403	.437	.426				1	7 5/16	8 7/8	OK	OK	OK	OK	OK	FLUSH	OK	7 5/16	6 5/8	3	OK	OK	OK	FLUSH	OK	S3		
50	X				.401	.419	.423	.415	.401				0	7 1/16	10 1/2	OK	OK	OK	OK	OK	OK	OK	6 3/4	11 3/16	3 3/8	OK	OK	OK	NONE	OK	S3		
51	X				.418	.424	.418	.435	.429				0	7 5/16	8 1/4	OK	OK	OK	OK	OK	FLUSH	OK	7 5/16	8 3/16	3	OK	OK	OK	FLUSH	OK	S3		
52	X				.414	.429	.427	.414	.431				1	7 1/4	7 7/8	OK	OK	OK	OK	OK	OK	OK	7 1/4	6 7/16	3	OK	OK	OK	FLUSH	OK	S3		
53	X				.400	.415	.410	.404	.400				0	7 1/16	10 1/2	OK	OK	OK	OK	OK	OK	OK	6 15/16	11 1/8	3 3/8	OK	OK	OK	NONE	OK	S3		
54	X				.426	.432	.429	.444	.426				0	7 5/16	8 7/8	OK	OK	OK	OK	OK	FLUSH	OK	7 3/16	6 3/16	3	OK	OK	OK	FLUSH	OK	S3		
55	X				.417	.417	.426	.430	.419				1	7 3/16	8 7/8	OK	OK	OK	OK	OK	FLUSH	OK	7 5/16	6 5/8	3	OK	OK	OK	FLUSH	OK	S3		
60	X				.419	.422	.419	.432	.426				2	7 3/16	8 9/16	OK	OK	OK	OK	OK	OK	OK	7 1/8	6 7/16	3	OK	OK	OK	FLUSH	OK	S3		
61	X				.403	.415	.425	.422	.403				0	7 1/16	10 7/16	OK	OK	OK	OK	OK	OK	OK	7	11 1/4	3 3/8	OK	OK	OK	NONE	OK	S3		
62	X				.415	.418	.437	.432	.415				0	7 1/16	9 3/4	OK	OK	OK	OK	OK	OK	OK	7 1/16	8 5/16	3 3/8	OK	OK	OK	NONE	OK	S3		
65	X				.394	.400	.406	.418	.394				0	7 1/16	9 5/8	OK	OK	OK	OK	OK	FLUSH	OK	7 1/8	10 3/8	3 3/8	OK	OK	OK	NONE	OK	S3		
74	X				.435	.449	.444	.435	.447				2	7 3/16	9 1/8	OK	OK	OK	OK	OK	FLUSH	OK	7 1/8	6 11/16	3	OK	OK	OK	FLUSH	OK	S3		
80	X				.435	.441	.450	.435	.446				2	7 1/8	9 1/16	OK	OK	OK	OK	OK	FLUSH	OK	7 5/16	8 1/16	3	OK	OK	OK	FLUSH	OK	S3		
89	X				.426	.445	.450	.441	.428				2	7 1/4	9	OK	OK	OK	OK	OK	FLUSH	OK	7 5/16	7 1/16	3	OK	OK	OK	FLUSH	OK	S3		
91	X				.410	.425	.434	.410	.422				0	7 5/16	9 1/16	OK	OK	OK	OK	OK	FLUSH	OK	7 1/4	7 1/4	3	OK	OK	OK	FLUSH	OK	S3		
97	X				.410	.410	.417	.440	.426				1	7 1/8	9 1/8	OK	OK	OK	OK	OK	OK	OK	7 3/16	8 3/8	3	OK	OK	OK	NONE	OK	S3		
104	X				.410	.410	.430	.433	.419				3	7 5/16	9 1/8	OK	OK	OK	OK	OK	FLUSH	OK	7 3/8	8 5/16	3	OK	OK	OK	FLUSH	OK	S3		

Pipe O.D. 5 1/2" **Grade** S-135 **Wt/Lbs/ft.** 24.70# **Wall Thickness** .415" **Connections** 5 1/2" FH

COMPLETE DRILLPIPE					PIPE BODY									TOOL JOINT																							
														BOX									PIN															
JT. #	ELECTRO-LOG CLASSIFICATION P	2	3	4	LOW WALL	ULTRASONIC WALL READINGS 1	2	3	4	O.D. Wear	Mash	Slip Area Dam.	Plastic Coating	O.D.	TONG SPACE	CONT. BORE DIA.	SHOUD WIDTH	CONT. BORE LGTH	SEAL WIDTH	BEVEL DIA.	HARD BAND	COND	O.D.	TONG SPACE	I.D.	SEAL WIDTH	BEVEL DIA.	NECK LGTH	HARD BAND	COND	Grade	Bent	Remarks					
106	X				.415	.417	.422	.415	.433				2	7 5/16	9	OK	OK	OK	OK	OK	FLUSH	OK	7 5/16	7 7/8	3	OK	OK	OK	FLUSH	OK	S3					
117	X				.410	.428	.436	.410	.433				1	7 5/16	7 3/8	OK	OK	OK	OK	OK	FLUSH	OK	7 3/8	7 7/16	3	OK	OK	OK	FLUSH	OK	S3					
120	X				.428	.441	.446	.452	.428				1	7 3/8	8 15/16	OK	OK	OK	OK	OK	FLUSH	OK	7 5/16	7 3/8	3	OK	OK	OK	FLUSH	OK	S3					
125	X				.420	.443	.430	.420	.431				2	7 1/8	8 1/16	OK	OK	OK	OK	OK	FLUSH	OK	7 5/16	7 3/16	3	OK	OK	OK	FLUSH	OK	S3					
128	X				.417	.431	.445	.417	.432				2	7 3/8	8 3/4	OK	OK	OK	OK	OK	FLUSH	OK	7 3/8	7 5/16	3	OK	OK	OK	FLUSH	OK	S3					
130	X				.421	.441	.421	.426	.448				2	7 5/16	9 1/16	OK	OK	OK	OK	OK	FLUSH	OK	7 3/8	7 5/8	3	OK	OK	OK	FLUSH	OK	S3					
132	X				.418	.419	.441	.425	.418				2	7 5/16	8	OK	OK	OK	OK	OK	FLUSH	OK	7 5/16	7 7/16	3	OK	OK	OK	FLUSH	OK	S3					
133	X				.430	.442	.457	.442	.430				2	7 5/16	8 7/8	OK	OK	OK	OK	OK	FLUSH	OK	7 3/8	8 1/8	3	OK	OK	OK	FLUSH	OK	S3					
134	X				.425	.425	.429	.448	.430				0	7 5/16	9 1/8	OK	OK	OK	OK	OK	FLUSH	OK	7 5/16	8 1/8	3	OK	OK	OK	FLUSH	OK	S3					
135	X				.425	.434	.425	.447	.426				0	7 5/16	9	OK	OK	OK	OK	OK	FLUSH	OK	7 5/16	8 3/16	3	OK	OK	OK	FLUSH	OK	S3					
136	X				.418	.418	.419	.423	.443				2	7 5/16	8 7/8	OK	OK	OK	OK	OK	FLUSH	OK	7 5/16	8 1/8	3	OK	OK	OK	FLUSH	OK	S3					
138	X				.428	.436	.442	.428	.437				2	7 5/16	9	OK	OK	OK	OK	OK	FLUSH	OK	7 3/8	7 5/8	3	OK	OK	OK	FLUSH	OK	S3					
139	X				.419	.441	.424	.419	.442				0	7 5/16	9 1/8	OK	OK	OK	OK	OK	FLUSH	OK	7 5/16	8 3/16	3	OK	OK	OK	FLUSH	OK	S3					
141	X				.421	.421	.424	.430	.428				1	7 1/8	8 3/8	OK	OK	OK	OK	OK	FLUSH	OK	7 1/8	9	3	OK	OK	OK	NONE	OK	S3					
142	X				.418	.429	.434	.425	.418				1	7 5/16	8	OK	OK	OK	OK	OK	FLUSH	OK	7 1/4	10 1/2	3	OK	OK	OK	FLUSH	OK	S3					
149	X				.402	.402	.411	.414	.407				2	7 3/16	8 1/8	OK	OK	OK	OK	OK	FLUSH	OK	7 1/16	10 1/4	3	OK	OK	OK	NONE	OK	S3					
154	X				.412	.419	.417	.412	.423				2	7 3/8	8 3/4	OK	OK	OK	OK	OK	FLUSH	OK	7 5/16	6 1/8	3	OK	OK	OK	FLUSH	OK	S3					
158	X				.422	.436	.422	.431	.429				2	7 5/16	8 1/4	OK	OK	OK	OK	OK	FLUSH	OK	7 5/16	7 1/4	3	OK	OK	OK	FLUSH	OK	S3					
159	X				.410	.410	.425	.429	.416				1	7 1/16	8 1/2	OK	OK	OK	OK	OK	FLUSH	OK	7 1/8	10 1/4	3	OK	OK	OK	NONE	OK	S3					
162	X				.416	.422	.433	.440	.416				0	7 1/8	10 1/2	OK	OK	OK	OK	OK	OK	OK	7	10 5/8	3 3/8	OK	OK	OK	NONE	OK	S3					
163	X				.411	.411	.416	.427	.418				0	7 3/16	8 11/16	OK	OK	OK	OK	OK	FLUSH	OK	7 1/4	6 1/2	3	OK	OK	OK	OK	OK	S3					
169	X				.423	.426	.430	.436	.423				0	7 3/16	9 1/8	OK	OK	OK	OK	OK	FLUSH	OK	7 3/8	6 5/8	3	OK	OK	OK	FLUSH	OK	S3					

C-110

0 Class 4
0 Class 3
0 Class 2
72 Premium
72 TOTAL

CODES FOR ABBREVIATIONS ON THIS SHEET:

PT Pulled Threads
STJ Short Tool Joint
DS Damage Shoulder
RG Regroove
RF Reface
W Washout
DT Damage Threads
RB Re bevel
BU Build Up Build Up Tool Joit
OF Over Fa Over Faced
SW Swelled
SCB Short C' Short C'Bore
C Crack
ECC Eccentric
US Undersized
B Bevel

INSPECTOR: Jose Aguilar

SEIS Form 505 Rev. 1

STATE ENERGY INSPECTION SERVICES, INC.
P.O. Box 1008
Crosby, TX 77532
Office: 281-962-2010
Fax: 281-962-2071

CUSTOMER NAME JT Miller
ADDRESS 15555 Miller Rd. 1, Houston, TX 77049
LOCATION 15555 Miller Rd. 1, Houston, TX 77049
CUSTOMER ORDER# 9947
WORK ORDER NO. 12759 **DATE:** 5/21/2015

INSPECTION REPORT OF USED DRILL PIPE

97 LENGTHS 5 1/2" O.D. GRADE S-135 WEIGHT 24.70# LB/FT

.415" WALL Tool Joint 5 1/2" FH RANGE II COATED PIPE NO

TYPE OF INSPECTION: **USED DRILL PIPE INSPECTION:** Electro-log Standard Rack Inspection, O.D. Gauging Full Length, Four Ultrasonic Readings Mid Tube and/or At Point of Wear, Clean and Visual Connections, Caliper OD's and Measure Tool Joint Lengths, and Separate Strutural Pipe Before Buggy Run

CLASSIFICATION

NOTE: THIS PIPE WAS INSPECTED TO: API - RP7G

SUMMARY OF RESULTS

0 LENGTHS PREMIUM CLASS PIPE IDENTIFIED BY ONE PUNCH MARK ON PIN TAPER AND TWO WHITE PAINT BANDS

0 LENGTHS PREMIUM CLASS PIPE IDENTIFIED BY ONE PUNCH MARK ON PIN TAPER AND TWO WHITE PAINT BANDS NEED TOOL JOINT REPAIR PRIOR TO USE FOR NORMAL DRILLING SERVICE

TOOL JOINT CONNECTION

SHOULDER DAMAGE		THREAD DAMAGE		RECUT		CRACKED		SWELLED
PIN	BOX	PIN	BOX	PIN	BOX	PIN	BOX	BOX

0 LENGTHS CLASS 2 PIPE IDENTIFIED BY TWO PUNCH MARKS ON PIN TAPER AND ONE YELLOW PAINT BAND

REASON FOR DOWN GRADING				
MASH	WALL	PITTING	SLIP AREA	STRETCHED

TOOL JOINT CONNECTION

SHOULDER DAMAGE		THREAD DAMAGE		BELOW MIN REQ		CRACKED		BELLED	REFACE	
PIN	BOX	PIN	BOX	PIN	BOX	PIN	BOX	BOX	PIN	BOX

0 LENGTHS CLASS 3 PIPE IDENTIFIED BY THREE PUNCH MARKS ON PIN TAPER AND ONE ORANGE PAINT BAND

REASON FOR DOWN GRADING				
WEAR	WALL	PITTING	SLIP AREA	TONG

TOOL JOINT CONNECTION

SEAL DAMAGE		THREAD DAMAGE		BELOW MIN REQ		CRACKED		BELLED	REFACE	
PIN	BOX	PIN	BOX	PIN	BOX	PIN	BOX	BOX	PIN	BOX

97 SEPARATE STRUCTURAL PIPE BEFORE BUGGY RUN AND CLASS 4

CRACK	HOLE	SEPARATED
		97

97 Total lengths Inspected

Comments:

REFACE	
PIN	BOX
0	0

Inspector: Jose Aguilar

SEIS Form 506 Rev. 1

STATE ENERGY INSPECTION SERVICES, INC.
Drill Pipe Worksheet

Customer: JT Miller

W.O. #: 12759 **P.O. #:** 9947 **Date:** 5/21/2015

Pipe O.D. 5 1/2" **Grade** S-135 **Wt/Lbs/ft.** 24.70# **Wall Thickness** .45" **Connections** 5 1/2" FH

COMPLETE DRILLPIPE					PIPE BODY									TOOL JOINT								
JT. #	ELECTRO-LOG CLASSIFICATION P	2	3	4	LOW WALL	ULATRASONIC WALL READINGS 1	2	3	4	Pitting	O.D. Wear	Mash	Slip Area Dam.	BOX O.D.	BOX LENGTH	BOX COND	PIN O.D.	PIN LENGTH	PIN I.D.	PIN COND	Grade	Bent	Remarks
85				SKIP	.									6 3/4	14 1/8	US	6 5/8	11 5/16	3 7/16	ECC	S3		UNDERSIZED
148				SKIP	.									6 15/16	7	US	6 15/16	3 7/8	3 1/2	STJ	S3		UNDERSIZED
129				SKIP	.									6 11/16	13 1/2	US	6 7/8	10 5/8	3 3/8	US	S3		UNDERSIZED
140				SKIP	.						10%			7 1/16	10 5/8	US	6 11/16	11 1/4	3 3/8	US	S3		UNDERSIZED
6				SKIP	.									6 7/8	10 3/4	US	6 15/16	11 1/4	3 3/8	OK	S3		UNDERSIZED
14				SKIP	.									7 1/16	10 1/2	OK	7	11	3 3/8	OK	S3		DOG LEGGED
22				SKIP	.									6 15/16	14 3/8	US	6 7/8	11	3 3/8	OK	S3		UNDERSIZED
23				SKIP	.									6 15/16	10 5/8	US	6 13/16	11 7/16	3 3/8	OK	S3		UNDERSIZED
24				SKIP	.									6 7/8	10 7/8	US	6 13/16	11	3 3/8	OK	S3		UNDERSIZED
25				SKIP	.									7	10 5/8	US	7 1/16	10 7/8	3 3/8	OK	S3		UNDERSIZED
26				SKIP	.									6 15/16	10 5/8	US	7	11 1/8	3 3/8	OK	S3		UNDERSIZED
28				SKIP	.									6 13/16	9 3/4	US	6 13/16	7 3/4	3 1/2	OK	S3		UNDERSIZED
31				SKIP	.									6 7/8	10 5/8	US	6 7/8	11 3/8	3 3/8	OK	S3		UNDERSIZED
35				SKIP	.									6 13/16	11 3/8	US	6 3/4	10 7/8	3 3/8	OK	S3		UNDERSIZED
36				SKIP	.									6 7/8	10 7/16	US	6 3/4	11 1/4	3 3/8	OK	S3		UNDERSIZED
37				SKIP	.									6 7/8	9 7/8	US	6 13/16	9 1/2	3	OK	S3		UNDERSIZED
38				SKIP	.									6 3/4	12 7/8	US	6 7/8	10	3	OK	S3		UNDERSIZED
48				SKIP	.									6 3/4	14 1/2	US	6 11/16	11 1/4	3 3/8	OK	S3		UNDERSIZED
49				SKIP	.									6 15/16	10 5/8	US	6 7/8	11 1/8	3 3/8	OK	S3		UNDERSIZED
56				SKIP	.									6 13/16	12	US	6 11/16	7 3/8	3 1/2	OK	S3		UNDERSIZED
57				SKIP	.									6 15/16	10 3/8	US	6 13/16	6 1/8	3	OK	S3		UNDERSIZED
58				SKIP	.									6 7/8	12 3/8	US	6 7/8	11	3 3/8	OK	S3		UNDERSIZED
59				SKIP	.									6 7/8	13 3/4	US	6 13/16	11	3 3/8	OK	S3		UNDERSIZED
63				SKIP	.									6 7/8	9 3/4	US	6 13/16	6 1/8	3 1/2	OK	S3		UNDERSIZED
64				SKIP	.									6 15/16	10 1/2	US	6 7/8	11 3/8	3 3/8	OK	S3		UNDERSIZED
66				SKIP	.									6 7/8	10 7/8	US	6 13/16	10 7/8	3 1/2	OK	S3		UNDERSIZED
67				SKIP	.									6 15/16	10 5/8	US	6 15/16	11 3/8	3 3/8	OK	S3		UNDERSIZED
68				SKIP	.									6 15/16	10 1/2	US	7	11 3/8	3 3/8	OK	S3		UNDERSIZED
69				SKIP	.									6 13/16	14 1/8	US	6 15/16	11 1/4	3 7/16	OK	S3		UNDERSIZED
70				SKIP	.									6 15/16	10 5/8	US	6 7/8	11 3/16	3 7/16	OK	S3		UNDERSIZED
71				SKIP	.									6 15/16	10 13/16	US	6 3/4	10 3/8	3 7/16	OK	S3		UNDERSIZED
72				SKIP	.									6 3/4	13 11/16	US	6 13/16	11 1/8	3 7/16	OK	S3		UNDERSIZED
73				SKIP	.									6 15/16	10 3/4	US	6 7/8	10 3/4	3 7/16	OK	S3		UNDERSIZED

Pipe O.D. 5 1/2" Grade S-135 Wt/Lbs/ft. 24.70# Wall Thickness .45" Connections 5 1/2" FH

COMPLETE DRILLPIPE					PIPE BODY									TOOL JOINT								
	ELECTRO-LOG CLASSIFICATION					ULATRASONIC WALL READINGS								BOX			PIN					
JT. #	P	2	3	4	LOW WALL	1	2	3	4	Pitting	O.D. Wear	Mash	Slip Area Dam.	O.D.	LENGTH	COND	O.D.	LENGTH	I.D.	COND	Grade	Bent	Remarks
121				SKIP	.									6 15/16	9 1/2	US	7 1/8	10 3/8	3	OK	S3		UNDERSIZED
122				SKIP	.									6 15/16	10 5/8	US	6 13/16	11	3 3/8	OK	S3		UNDERSIZED
123				SKIP	.									6 7/8	12	US	6 13/16	10 3/16	3	OK	S3		UNDERSIZED
124				SKIP	.									6 15/16	10 5/8	US	6 7/8	10 13/16	3 3/8	OK	S3		UNDERSIZED
126				SKIP	.									6 13/16	12 5/8	US	7	10 1/8	3	OK	S3		UNDERSIZED
127				SKIP	.									6 7/8	10 13/16	US	6 15/16	10 5/8	3 3/8	OK	S3		UNDERSIZED
131				SKIP	.									6 15/16	10 5/8	US	7	10 7/8	3 3/8	OK	S3		UNDERSIZED
137				SKIP	.									6 7/8	12 1/2	US	7	9	3	OK	S3		UNDERSIZED
143				SKIP	.									6 13/16	11 1/4	US	6 7/8	9 1/2	3	OK	S3		UNDERSIZED
144				SKIP	.									6 13/16	10 9/16	US	6 7/8	11 1/8	3 3/8	OK	S3		UNDERSIZED
145				SKIP	.									6 13/16	13 3/4	US	6 3/4	11 1/4	3 3/8	OK	S3		UNDERSIZED
146				SKIP	.									6 3/4	13 1/4	US	6 3/4	11 1/8	3 1/2	OK	S		UNDERSIZED
147				SKIP	.									6 13/16	14	US	6 11/16	11 1/4	3 3/8	OK	S3		UNDERSIZED
150				SKIP	.									7 1/16	10 1/2	OK	6 15/16	11 3/8	3 3/8	OK	S3		DOG LEGGED
151				SKIP	.									6 11/16	13 5/8	US	6 13/16	11	3 3/8	OK	S3		UNDERSIZED
152				SKIP	.									6 7/8	14 3/8	US	6 13/16	11 3/8	3 3/8	OK	S3		UNDERSIZED
153				SKIP	.									6 15/16	10 1/4	US	7	10 7/8	3 3/8	OK	S3		UNDERSIZED
155				SKIP	.									7 1/16	10 1/2	OK	7	11 1/8	3 3/8	OK	S3		TWISTED
157				SKIP	.									7 1/16	10 3/8	OK	7 1/16	11 1/4	3 3/8	OK	S3		DOG LEGGED
158				SKIP	.									6 7/8	10 5/8	US	6 13/16	11 3/8	3 3/8	OK	S3		UNDERSIZED
160				SKIP	.									7 1/16	10 1/2	OK	6 15/16	11 1/4	3 3/8	OK	S3		DOG LEGGED
161				SKIP	.									6 15/16	8 5/8	US	6 7/8	10 5/8	3 1/2	OK	S		UNDERSIZED
164				SKIP	.									6 7/8	10 11/16	US	6 13/16	11 3/8	3 3/8	OK	S3		UNDERSIZED
165				SKIP	.									6 15/16	10 5/8	US	6 13/16	10 3/4	3 3/8	OK	S3		UNDERSIZED
166				SKIP	.									6 13/16	10 1/2	US	6 13/16	9 1/16	3 3/8	OK	S3		UNDERSIZED
167				SKIP	.									6 7/8	10 1/2	US	6 13/16	11 3/8	3 3/8	OK	S3		UNDERSIZED
168				SKIP	.									6 13/16	9 5/8	US	6 15/16	10 1/2	3	OK	S3		UNDERSIZED

97 Class 4/Skippe
0 Class 3
0 Class 2
0 Premium
97 TOTAL

CODES FOR ABBREVIATIONS ON THIS SHEET:

PT	Pulled Threads	RF	Reface	BU	Build Up Tool Joint
STJ	Short Tool Joint	W	Washout	OF	Over Faced
DS	Damage Shoulder	DT	Damage Threads	SW	Swelled
RG	Regroove	RB	Re bevel	SCB	Short C' Bore

C	Crack		
ECC	Eccentric		
US	Undersized		
B	Bevel		

INSPECTORS: Jose Aguilar

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